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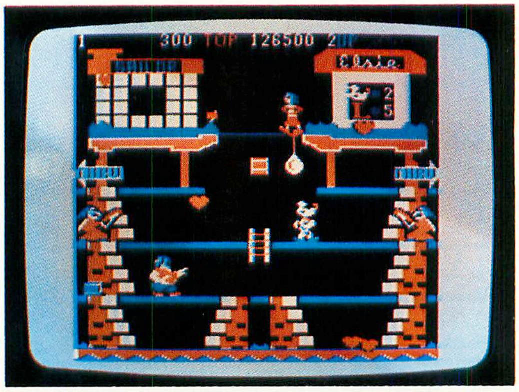
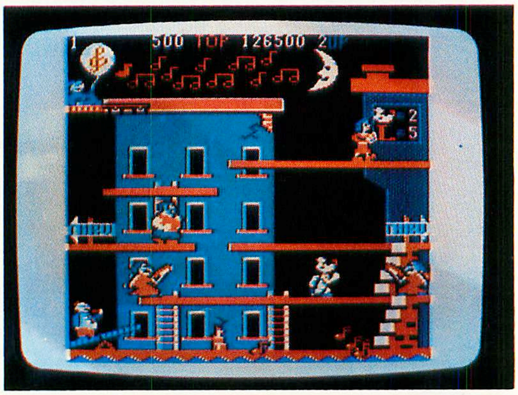
ANNOUNCING!

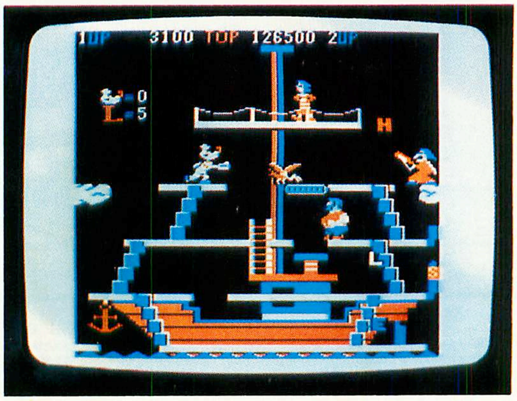
The SAILOR MAN

3 Screens-Plus-"INVISO SCREEN"

The First 64K Arcade Game For the Color Computer







The first screen objective is to catch enough of Elsie's kisses (those Red Heart Shaped Things) to fill in the squares on the Sailorman's house. If you can time your punch just so, you can send the punching bag over to knock the bucket down and, with a little bit of luck, right onto **Bigfatbadguy's** head. This will give you a little (but not much) time to catch all those RHSTs.

You must avoid contact with **Bigfatbadguy** who is actively pursuing you. You must also be careful of **Olduglyseawoman** who will appear at higher difficulty levels to chuck empties at you. Either avoid the flying bottles or punch them (with the fire button) to keep from being knocked into the water.

The second screen objective is to collect enough notes to play Elsie a little love song. You may jump off and onto the other end of **Fatguyeatingahamburger's** teetertotter to fly up a deck and even two decks if you manage to catch hold of **Smartaleckkid's** grab handles. Time it right and away you go.

The Third screen objective is to collect enough letters (thrown by Elsie's cries for H-E-L-P) to complete a ladder all the way to the crow's nest where Elsie is calling you. Beware of the Crow, however, who thinks you are after her eggs!

On all screens, eating a can of **collard greens** (labeled "S" for Collard and grasped by punching the can just right) will give you amazing speed, strength and agility and allow you to send **Bigfatbadguy** into the drink with a single punch.

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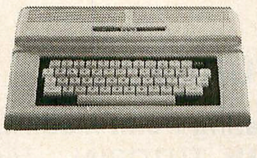

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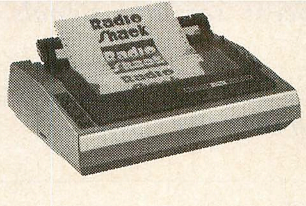

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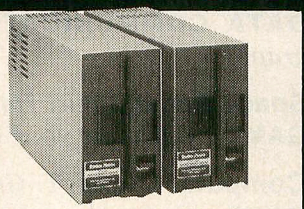

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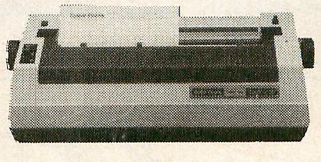

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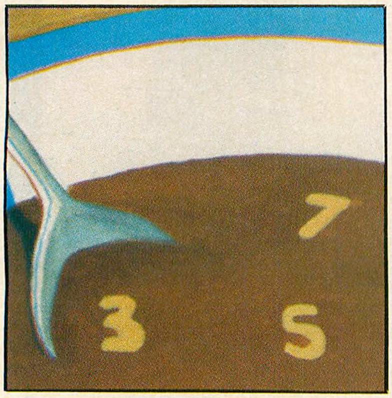

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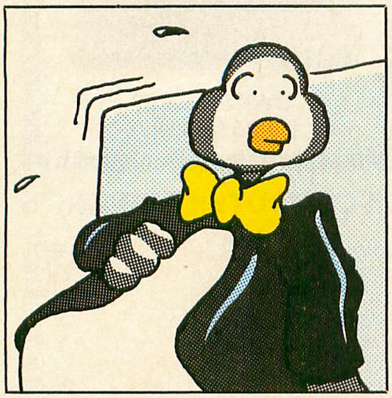

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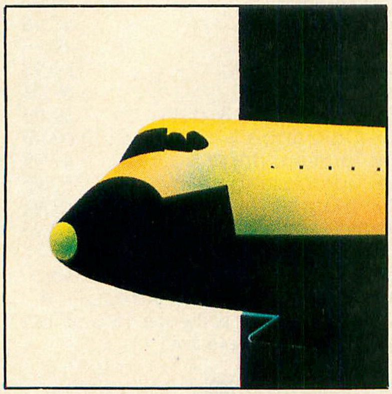

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NEXT MONTH: Our business and finance issue. Long-time contributor Jorge Mir will be back! And, along with our RAINBOW regulars we'll also have Susan Davis, Tim Harris and Brian Lantz. In addition to a solid payroll program, we show you how to prepare a personal income statement and how to measure your performance in the stock market. We'll also look at treasury bill investments and we'll provide a program to show you how to buy in quantity to save money. We'll also have a BASIC09 mailing list program, and we'll launch our Third Annual Rainbow Adventure Contest!.

But our CoCo isn't an all work and no play machine, so look for a variety of other useful articles and listings, and games, too. Reach for the March RAINBOW for more on the Color Computer than is available from any other source!

Cover art© by Fred Crawford

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The RAINBOW

February 1985 Vol. IV No. 7

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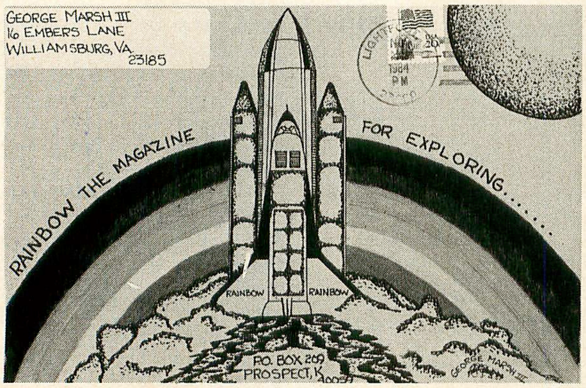
Limited back issues are available. Please see notice for issues which are in print and costs. Payment accepted by VISA, MasterCard, American Express, Cash, Check or Money Order in U.S. currency only.

LETTERS TO THE RAINBOW

ARTS AND LETTERS



George Marsh III
Williamsburg, VA

Envelope Of The Month

IN PURSUIT OF SCHOLARLY SOFTWARE

Editor:

There has always been an interest in promoting the use of Color Computers in education in THE RAINBOW. You have run highly successful programming contests in the past. I would like to propose that you combine the two into an educational software programming contest.

The Color Computer has a decided lack of educational software available for it compared to other popular systems. All of the educational software catalogs that are mailed to me as a teacher have precious little for the Color Computer. The impression created is that there is virtually no software.

You probably can't help what makes it into the software catalogs we get, but a successful contest would produce winners for publication in your annual September back-to-school issue, and the top dozen or two programs could then be made available in book/cassette combination similar to what you did with your Adventure game contest.

Anything would help. Please consider the idea. Thank you.

Paul French
Burlington, IA

INFORMATION PLEASE

Editor:

While recently devouring the December 1984 issue of THE RAINBOW, I came across the advertisement "Announcing . . . The Rainbow Bookshelf." I am interested in your products, although I do have a question or two.

You advertised *The Rainbow Book of Simulations,* which had both a book and a tape. Along with that was also *The Rainbow Book of Adventures,* which also had both the book and tape. Is it necessary to have the book to have the tape, or vice versa? Or does that book consist of the programs, etc., while the tape does not?

I am interested in purchasing them, but I am curious about the difference/similarities. Please advise so that I may order accordingly.

Also, do you have any other books from the Bookshelf?

Thank you for such a great magazine and keep up the great work.

Dave Helfrich
New Port Richey, FL

Editor's Note: Both books have all the listings and instructions needed to use each program. The tapes have *only* the programs; you still need the book for operating instructions. *The Complete Rainbow Guide To OS-9* is the latest Rainbow Bookshelf offering. A second Adventure book and a second Simulations book are among works in progress.

COURSE ON MORSE?

Editor:

I am writing to you to see if I can find any tapes on Morse code for the TRS-80 Color Computer — learning, sending or receiving?

I enjoy THE RAINBOW, keep it up.

Oscar H. Ash, Jr.
Willoughby, OH

COCO CHOO-CHOO

Editor:

I would like to know if anyone has in the past or is currently utilizing their CoCo to control a model railroad? If so, please write me at 1492 Chaffee Court, 60007.

Patrick Quinnett
Elk Grove Village, IL

'BEEPING' WITH THANKS

Editor:

I [wish to] express thanks and compliments to Marc Labbe of Biddeford, Maine, for his hints and tips in the December 1984 RAINBOW magazine, Page 6.

Thank you Marc, my computer beeps everytime I press the keyboard.

Paul Ellias
Chicago, IL

Editor:

In your December 1984 issue under "Hints and Tips" in "Letters To The Rainbow" there is a letter from Marc Labbe that makes a key-beep. If you change *POKE 1541,4* to *POKE 1541,0* this produces more of a key-click sound.

I saved it to tape and load and run it every time I power up. This doesn't slow up the listing of a program nearly as much as the key-beep.

John R. Reed
Easton, MD

HINTS AND TIPS

Editor:

Here is a hint for your readers. To make shorter sounds in BASIC, *POKE 140,* (a number 1-255 for the tone): *EXEC43345* ENTER.

```
10 FOR J =2 TO 100 STEP 5
20 FOR I =1 TO 255 STEP J
30 POKE 140,I:EXEC43345
40 NEXT I
```

Paul Wagorn
Carp, Ontario

INTRODUCTION LINE

Editor:

I would like to pass on to your readers this tip I have found very useful.

Since most programs do not use Line 0 as a program statement, I insert a *REM* statement listing the program name, publication, month, year and page number. This enables me to find the listing or supporting documentation for debugging or what have you. For example:

```
0 REM ROAD RACE;RAINBOW 11/84,36
```

If Line 0 is being used, I just insert the *REM* statement as the last line of the program.

Wayne C. Bell
Bangor, PA

TV GUIDE

Editor:

Here are some computer "programs" that beginners, as well as experienced hackers, might enjoy.

Innovation — PBS
The New Tech Times — PBS
The New Literacy — PBS
Educational Computing — PBS
Family Computing — Lifetime (Cable)
The Computer Programme — PBS

Check your local public TV stations and cable system for times.

Mike Sims
Nanuet, NY

BREAKING THE SPEED LIMIT

Editor:

I received a letter from Mr. Glenn P. Alfrey who has a problem saving a program to tape. It is evident that Mr. Alfrey is trying to save the program while the computer is in the high speed mode.

It would be a good idea for you to remind your readers that whenever a program uses a *POKE 65495,0* statement, they should always *POKE 65494,0* before trying to save on cassette in order to reset the computer to its normal speed.

Jacques Bourgeois
Longueuil, Quebec

COMPUTER CONSORTIUM

Editor:

ECCO, the Educational Computer Consortium of Ohio, is now accepting proposals for presentation for its Fifth Annual Educational Computer Fair, to be held on Friday and Saturday, October 11-12, 1985 in Cleveland.

Classroom teachers, administrators, university faculty and those with practical computer education experience are encouraged to submit proposals. We are searching for proposals in all content areas and grade levels, preschool through college, for both beginning and advanced computer educators. We are particularly interested in applications into all areas of the curriculum.

To obtain the brief proposal form, send a request to Alice Fredman, Director, ECCO, 1123 S.O.M. Center Road, 44124.

Vendors are invited to contact ECCO for information about commercial displays.

Alice Fredman
Cleveland, OH

BULLETIN BOARD SERVICE

Editor:

My school is interested in setting up a bulletin board. If anyone has a BBS at their school, please write me at P.O. Box 1123, 32742 and tell me about it.

Richard Beck IV
Kissimmee, FL

Editor:

We would like to announce the Great Gamma Color 80 BBS of the colonial capital of Virginia. The BBS number is (804) 887-5302 and is operating 24 hours.

We have many downloadable programs; our database has weekly football standings, members' movie reviews and many others. We have electronic shopping with Radio Shack products from Williamsburg Radio Shack with owner Dennis Welch sponsoring our BBS. We welcome all types of computers. Our mailing address is The Great Gamma BBS, 16 Embers Lane 23185.

George Marsh
Williamsburg, VA

Editor:

North Shore BBS will be on line 24 hours a day, seven days a week. We have downloads, uploads as well as electronic mail and all features of *Colorama BBS* software. For more information call (302) 227-4375 or write North Shore BBS, Eric Flores (SYSOP), U.S.CG Indian River, 19971.

Eric Flores
Rehoboth Beach, DE

Editor:

The Syracuse High School Computer Club is operating a BBS at (316) 384-7446. Hours are from 5 p.m. to 7 a.m., M.S.T.

Greg Davidson
Syracuse, KS

Editor:

I have been operating a BBS in San Jose since last December. I bought the BBS from Shawn Jipp (the old 733-6809 number). My number is (408) MAX—BBSS or (408) 629-2277 and operates 24 hours, seven days a week. The BBS signs on with the logo of MicroBur BBS on a *Color 80 BBS* program.

Terrance D. Burnes
San Jose, CA

Editor:

We would like to announce The Peninsula CoCo Board now in service in the Peninsula area of Virginia. It is being run on a 64K CoCo with two DSDD TEAC drives, but is open to everyone. We are using the *Color 80 BBS* software. The board is open seven days a week, 24 hours a day. It supports downloading, uploading, messages and a data file at 300/1200 Baud. The phone number is (804) 868-0922.

Bill Satterwhite
Tabb, VA

Editor:

I run the Lighthouse BBS in Renton. My address and phone number is 3813 NE 8th Court, 98056, (206) 255-5150.

Marshall Butler
Renton, WA

PRINTER PRESCRIPTION

Editor:

In the December 1984 issue, Page 8, "Letters To Rainbow," Rogers George IV, Terrace, Minn. has a ribbon replacement problem for "Impact Data Printer."

Computer Friends, 6415 SW Canyon Court, Suite 10, Portland, OR 97225, has a wide variety of cartridges, loaded or empty, and ribbon reloads. I suggest he write them; ask about the MacInker — it's great.

THE RAINBOW is still fantastic. Keep it up.

J. Stewart Campbell
Ocean City, NH

BOUQUETS

Editor:

Often you print letters expounding the merits of THE RAINBOW, and I must agree, THE RAINBOW is the one for me, too. A poll on a local CoCo BBS indicates that THE RAINBOW is the favorite of all the CoCo users in the area.

However, the reason I'm writing this letter is to applaud one of your advertisers. Endicott Computer Software And Accessories of Huntsville, Ala. I have been purchasing products from Endicott for several months and their products, prices and service are always as advertised.

Recently, I received a software package that contained a flawed diskette. In a short telephone conversation with an Endicott employee, I was told to return the package to them. I did so, and in less than two weeks I received a brand new replacement. Considering the shipping time (two ways) I feel their attention to my problem was superb and worthy of emulation by the majority of the mail-order houses that are vying for our business today.

S.M. Whitehouse, Jr.
Clearwater, FL

Editor:

I recently purchased a Video Pal Video and Audio Interface from RGS Micro, Inc. in Montreal, an advertiser in THE RAINBOW. It was delivered by certified mail and arrived in five days. Unfortunately, some of the pins on the 40-pin header were damaged in shipment, so I returned it to them. Within a week, I received an undamaged unit.

The instructions were printed on two sheets of paper (four pages) and included a parts layout diagram. The instructions were detailed and easy to follow. The unit functions as advertised (driving an Amdek 300A Monitor).

Total elapsed time for this unit to travel across Canada four times was 13 days, which is excellent service indeed. I highly recommend RGS Micro.

D.E. Wilson
West Vancouver, British Columbia

Editor:

Being a person who gets up on his hind legs and screams to the high heavens when I am wronged puts me under an obligation to comment when I am unusually well treated!

I bought Dennis Derringer's *Master Design*. It worked, but not perfectly. A letter to him brought by return mail a new version suited to the somewhat different combination of equipment that I use — without charge!

Having purchased his *Pro-Color-File Enhanced*, I had difficulty getting it to work. I am not as computer literate as I would like to be, and had difficulty understanding the directions. The extreme patience that Dennis Derringer showed me when I called him, soon had me on the right track — and now that I understand how to make it go, I am aware that the directions actually covered every question I had. It's a fine program, very versatile, and with a national users group.

Hugo Spatz
Port Charlotte, FL

KUDOS

Editor:

Thank you so much for bringing RAINBOWfest to Irvine, Calif. I am really looking forward to it.

I would like to say that I subscribed to another Color Computer magazine before finding THE RAINBOW. THE RAINBOW is by far the best CoCo magazine on the market. Thank you for all the programs and all the things you've taught me about my CoCo.

Becky Bergsma
Corona, CA

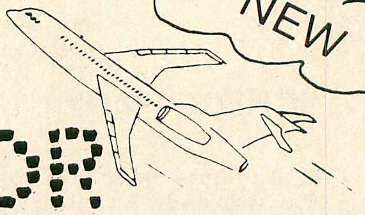
PRAISE FOR PASCAL

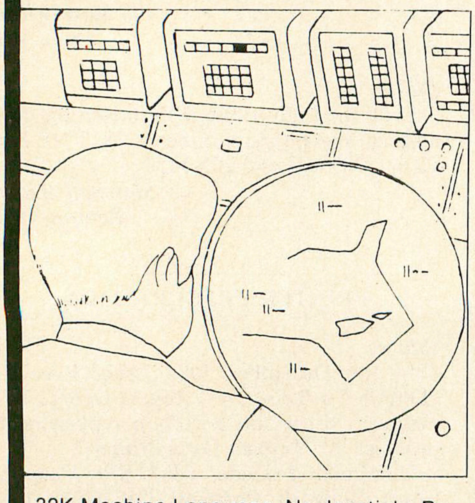
Editor:

This is just a note commending you on Daniel Eastham's "Personable Pascal" articles.

I've really been enjoying them, they're an excellent diversification for the magazine. Thanks!

Mark Mosty
Kerrville, TX





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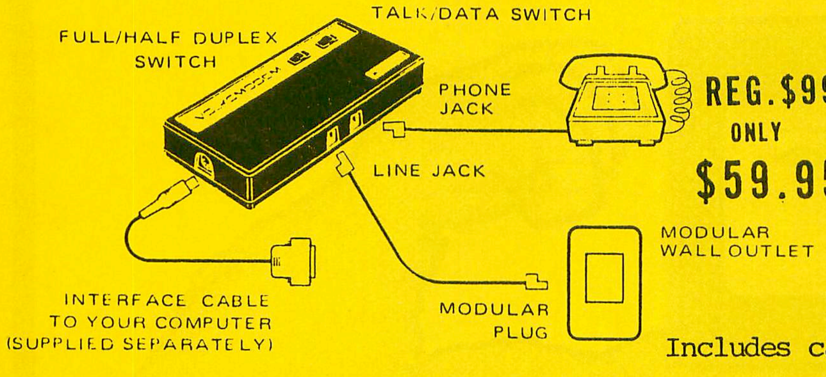

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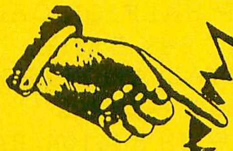

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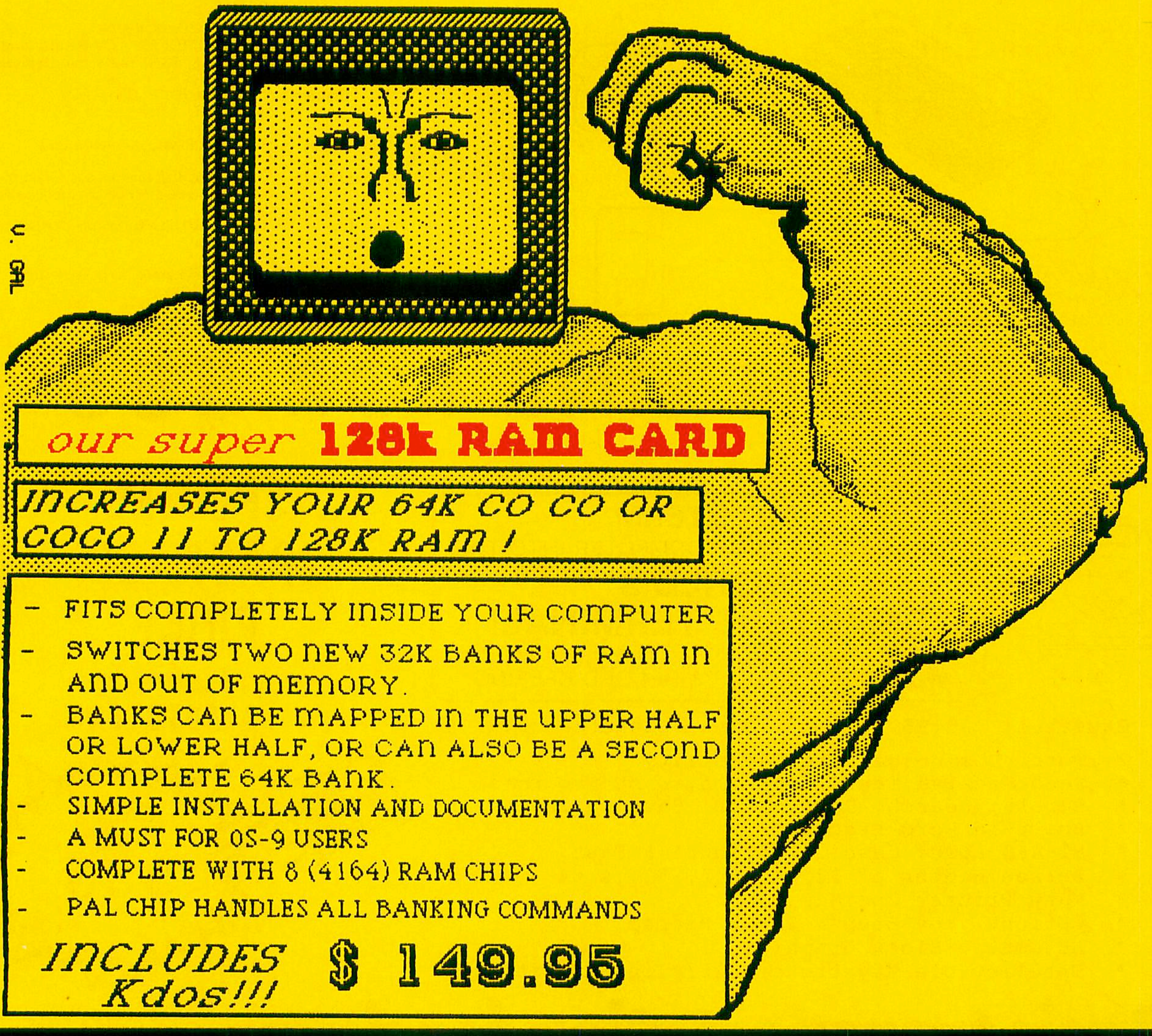

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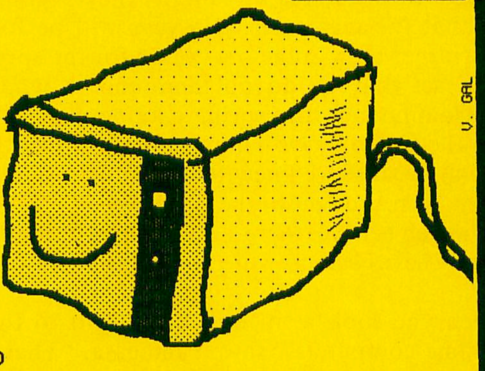

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WRITE FOR
OUR CATALOG

PRINT #-2,

Our favorite computer — Radio Shack's CoCo — is the best selling machine Tandy Corp. has ever had and is expected to continue its leadership in the foreseeable future, according to top planners in the firm's computer merchandising area.

"In terms of units sold, the Color Computer is far and away the best selling computer we have ever had," Mark Yamagata, director of computer merchandising-personal computer products, told THE RAINBOW in an exclusive interview.

"Not only is it our best seller, but all our plans, buying strategy and marketing decisions, anticipate that it will continue to be the number one computer in sales in the Tandy line," he added.

However, in a whimsical aside, Yamagata noted that, effective almost immediately, "there will be no more TRS-80 Color Computers manufactured." The reason? All of Tandy's new computers — as well as most of its present line — will be known as "Tandy" computers from now on. "So, it now becomes the Tandy Color Computer," Yamagata explained.

Indeed, in a wide-ranging interview with THE RAINBOW, Yamagata and Barry Thompson, Color Computer product line manager, exuded enthusiasm about plans for continued support and expansion of the Color Computer line — now Tandy Color Computer line — in both the immediate and prospective future.

As to the immediate future, Thompson points out that considering the scope of the CoCo market, buying decisions have to be made as much as a year in advance. Thus, in December 1984, Tandy is already beginning to make decisions on how many CoCos it will sell for the holiday buying season next year.

Yamagata gestured toward Thompson: "He's still here and that's what he's doing — buying Color Computers for next Christmas. Lots of them. As long as he's here, we'll be buying Color Computers."

"And I'm not going anywhere," Thompson confirms.

Both Thompson and Yamagata acknowledge that they see the Color Computer as a consumer product whose sales will become somewhat more seasonal than they have been historically. Because of this, many new products for CoCo will appear in the fall rather than the spring.

"But we will continue to bring new products and programs for the Color Computer to the stores as soon as they become available," Yamagata says. "It is just that the real push each year will be for products appearing in the fall catalog rather than in the one we do for the spring."

"The fact that we do not announce a whole bunch of new things for the Color Computer in the spring catalog does not mean that we are in any way soft on the CoCo," says Thompson. "It is just that many things were announced in the fall because we knew then that we would produce them. Some, of course, have not been brought to the stores yet."

Thompson believes there is still a huge, untapped market for "home" computers. And he believes Tandy will get a huge share of that market — as it has already done.

"When you look at it, only some two to three percent of American homes have home computers," says Yamagata. "That leaves a market that is huge by any comparison. And, I believe we have demonstrated that we will have a large share of that market — as we do now."

Thompson points out there have been some industry "experts" who have compared the home computer market with the Citizen's Band craze of several years ago. But, he adds: "This has passed the CB radio stage and passed the CB radio philosophy. So many people thought that home computers would die out like CB radio, but that has not happened."

"Of course, in order for this to continue, the home computer has to be viewed as a personal productivity tool. One of the things we are trying to do is enhance an individual's use of a computer in the home or small business as a device which can increase that person's personal productivity."

Because of this, both Yamagata and Thompson put little credence in reports that the day of the eight-bit computer is numbered.

Telewriter-64™

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- **3 display formats: 51/64/85 columns × 24 lines**
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THE ORIGINAL

Simply stated, Telewriter is the most powerful word processor you can buy for the TRS-80 Color Computer. The original Telewriter has received rave reviews in every major Color Computer and TRS-80 magazine, as well as enthusiastic praise from thousands of satisfied owners. And rightly so.

The standard Color Computer display of 32 characters by 16 lines without lower case is simply inadequate for serious word processing. The checkerboard letters and tiny lines give you no feel for how your writing looks or reads. Telewriter gives the Color Computer a 51 column by 24 line screen display with *true lower case characters*. So a Telewriter screen looks like a printed page, with a good chunk of text on screen at one time. In fact, more on screen text than you'd get with Apple II, Atari, TI, Vic or TRS-80 Model III.

On top of that, the sophisticated Telewriter full-screen editor is so simple to use, it makes writing fun. With single-letter mnemonic commands, and menu-driven I/O and formatting, Telewriter surpasses all others for user friendliness and pure power.

Telewriter's chain printing feature means that the size of your text is never limited by the amount of memory you have, and Telewriter's advanced cassette handler gives you a powerful word processor without the major additional cost of a disk.

> *...one of the best programs for the Color Computer I have seen...*
> — Color Computer News, Jan. 1982

TELEWRITER-64

But now we've added more power to Telewriter. Not just bells and whistles, but major features that give you total control over your writing. We call this new supercharged version Telewriter-64. For two reasons.

64K COMPATIBLE

Telewriter-64 runs fully in any Color Computer — 16K, 32K, or 64K, with or without Extended Basic, with disk or cassette or both. It automatically configures itself to take optimum advantage of all available memory. That means that when you upgrade your memory, the Telewriter-64 text buffer grows accordingly. In a 64K cassette based system, for example, you get about 40K of memory to store text. So you don't need disk or FLEX to put all your 64K to work immediately.

64 COLUMNS (AND 85!)

Besides the original 51 column screen, Telewriter-64 now gives you 2 additional high-density displays: 64 × 24 and 85 × 24!! Both high density modes provide all the standard Telewriter editing capabilities, and you can switch instantly to any of the 3 formats with a single control key command.

The 51 × 24 display is clear and crisp on the screen. The two high density modes are more crowded and less easily readable, but they are perfect for showing you the exact layout of your printed page, *all on the screen at one time*. Compare this with cumbersome "windows" that show you only fragments at a time and don't even allow editing.

RIGHT JUSTIFICATION & HYPHENATION

One outstanding advantage of the full-width screen display is that you can now set the screen width to match the width of your printed page, so that "what you see is what you get." This makes exact alignment of columns possible and it makes hyphenation simple.

Since short lines are the reason for the large spaces often found in standard right justified text, and since hyphenation is the most effective way to eliminate short lines, Telewriter-64 can now promise you some of the best looking right justification you can get on the Color Computer.

FEATURES & SPECIFICATIONS:

Printing and formatting: Drives any printer (LPVII/VIII, DMP-100/200, Epson, Okidata, Centronics, NEC, C. Itoh, Smith-Corona, Terminet, etc).

Embedded control codes give full dynamic access to intelligent printer features like: underlining, subscript, superscript, variable font and type size, dot-graphics, etc.

Dynamic (embedded) format controls for: top, bottom, and left margins; line length, lines per page, line spacing, new page, change page numbering, conditional new page, enable/disable justification.

Menu-driven control of these parameters, as well as: pause at page bottom, page numbering, baud rate (so you can run your printer at top speed), and Epson font. "Typewriter" feature sends typed lines directly to your printer, and Direct mode sends control codes right from the keyboard. Special Epson driver simplifies use with MX-80.

Supports single and multi-line headers and automatic centering. Print or save all or any section of the text buffer. Chain print any number of files from cassette or disk.

File and I/O Features: ASCII format files — create and edit BASIC, Assembly, Pascal, and C programs, Smart Terminal files (for uploading or downloading), even text files from other word processors. Compatible with spelling checkers (like Spell 'n Fix).

Cassette verify command for sure saves. Cassette auto-retry means you type a load command only once no matter where you are in the tape.

Read in, save, partial save, and append files with disk and/or cassette. For disk: print directory with free space to screen or printer, kill and rename files, set default drive. Easily customized to the number of drives in the system.

Editing features: Fast, full-screen editor with wordwrap, block copy, block move, block delete, line delete, global search and replace (or delete), wild card search, fast auto-repeat cursor, fast scrolling, cursor up, down, right, left, begin line, end line, top of text, bottom of text; page forward, page backward, align text, tabs, choice of buff or green background, complete error protection, line counter, word counter, space left, current file name, default drive in effect, set line length on screen.

Insert or delete text anywhere on the screen without changing "modes." This fast "free-form" editor provides maximum ease of use. Everything you do appears immediately on the screen in front of you. Commands require only a single key or a single key plus CLEAR.

> *...truly a state of the art word processor... outstanding in every respect.*
> — The RAINBOW, Jan. 1982

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RAINBOW
CERTIFICATION
SEAL

Apple II is a trademark of Apple Computer, Inc.; Atari is a trademark of Atari, Inc.; TRS-80 is a trademark of Tandy Corp; MX-80 is a trademark of Epson America, Inc.

"If you get what you want done, at a cost that you want," Thompson says, "no one cares whether he is using an eight-bit or 16-bit machine. The 'average' new user doesn't care if there are eight bits or eight million — so long as the job gets done. We know the CoCo can do the job."

This, interjects Yamagata, is further proof that the home computer market is, essentially, a consumer market. The typical consumer is not into the hardware, the details of programming or other aspects of computing as is the hobbyist. "He wants to get the job done," Yamagata believes.

But, as Thompson points out, the Color Computer is, in many ways, a 16-bit machine anyway. Yet "we don't advertise it that way — maybe because we're a little more conservative, or a little more truthful," he says.

Of great interest, Yamagata points out, is that more and more "name" software firms are beginning to work with Tandy. One of them, Imagic, has a program due out soon.

"Why are these people coming to us more and more?" Yamagata asks. "Because they see a very healthy and an increasing share of the market. We still don't release our sales figures, but the message is pretty plain in the marketplace.

"The Color Computer is clearly the leader in the home computer field and we intend to do what we can to keep it that way."

So, what about the future?

"Of course, we plan to extend and expand the Color Computer," Yamagata says. "We would be foolish if we were to cut out the most successful computer we manufacture.

"Naturally, there will be some changes and additions to the line, as time goes by," he adds. "But, remember, one of the major benefits of a Tandy computer has always been that it is upwardly compatible so that software that runs on a Color Computer today will run on a Color Computer tomorrow. This, of course, pertains to our own software as well as the software from people who do not use undocumented calls into the ROM.

"I think this is a very important consideration in the computer market. It is something we have considered very important at Tandy and it should certainly be a major consideration for people who buy computers."

The one watchword of the future? "This is our — and one of the world's — most successful computers, in terms of sales, customer acceptance and value," says Yamagata.

"Anyone who had a product like that would be a fool to do anything less than continue to support it 100 percent. We may be a lot of things here, but foolish certainly isn't one of them."

— Lonnie Falk

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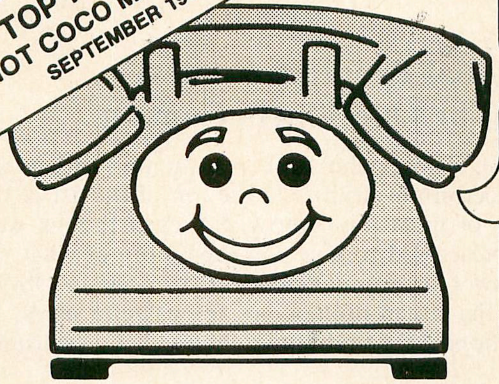

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DUAL PROCESSING lets you review & edit while more data is coming in.

Fully supports D.C. Hayes and other intelligent modems.

Talks to your printer with any page size, margins, line spacing, split word avoidance. Embed your printer's control sequences for boldface, underlining, etc. Narrow text can be automatically spread out.

You'll also use Autoterm for simple word processing and record keeping

You can display directories, delete files, transmit directly from disk, and work with files larger than memory. Easily maintain a disk copy of an entire session.

Compatible with TELEWRITER (ASCII) & other word processors.

SMOOTH WALKIN'

AUTOTERM moves smoothly and quickly between word processing and intelligent terminal action. Create text, correct your typing errors; then connect to the other computer, upload your text, download information, file it, and sign-off; then edit the received data, print it in an attractive format, and/or save it on file.

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The word processor can be used to create, print, and/or save on file your personal KSMs. They let AUTOTERM act like you. For example, it can dial through your modem, sign-on, interact, perform file operations, & sign-off; an entire session without your help. KSMs can answer the phone, prompt the caller, take messages, save them, hang-up, and wait for the next call. The KSM potential is unbelievable!

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"Almost a full featured word processor..."
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Teachers agree: LOGO is the best way to introduce children to computers. Now, with **LOGO STARTER** you won't have to read a book or instruction manual. Just load the **LOGO STARTER** tape. Your child will draw exciting designs right from the start. You won't waste your time on a lot of tedious typing. And your child will be on the way to computer literacy. (Requires Radio Shack Color LOGO) $13.95

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Our Utilities Issue . . .
Maybe An Educational Program Contest . . .
And, Let's Keep The One-Liners Coming . . .

This is our utilities issue. Those who took part in our survey at the RAINBOWfest in Princeton put utilities at the top of the list of things they'd like to see more of in THE RAINBOW. So, even though we had several utilities last month, we decided to give you even more of what you're most asking for. Also in answer to popular demand, two are in OS-9 and one is in BASIC09. Some of the other utilities are for cassette users, while others are for disk. We do hope you find some choice pickings from this month's offerings.

For a long while, we had intended this to be our Adventure contest kickoff edition. And, yes, we already have a number of prizes lined up for our Third Annual Rainbow Adventure Contest. We'll just wait a bit and sound the starting gun next month as something lighter to complement the material in our March business and financial issue. If you can't wait to get started, plunge on in; the rules will be similar to last year's.

Speaking of contests, what do you think of one for educational programs? Paul French, of Burlington, Iowa, proposes such a competition in this month's Letters to the Editor. Sure, we've considered such a contest, but maybe his letter is what we needed to go into action. What do you think? What sort of rules? Who should we get to do the judging? Share your thoughts with us. While you're at it, maybe you have an idea for another contest. And, while we're asking, what sort of extra treat would you like to see in RAINBOW's fourth anniversary issue in July? As many of you know, we always include a surprise in the anniversary issue. Last year, we had the Scratch and Sniff Adventure. The year before: a soundsheet with three computer programs recorded on it ready to load in and run. This year? Maybe your idea's time has arrived.

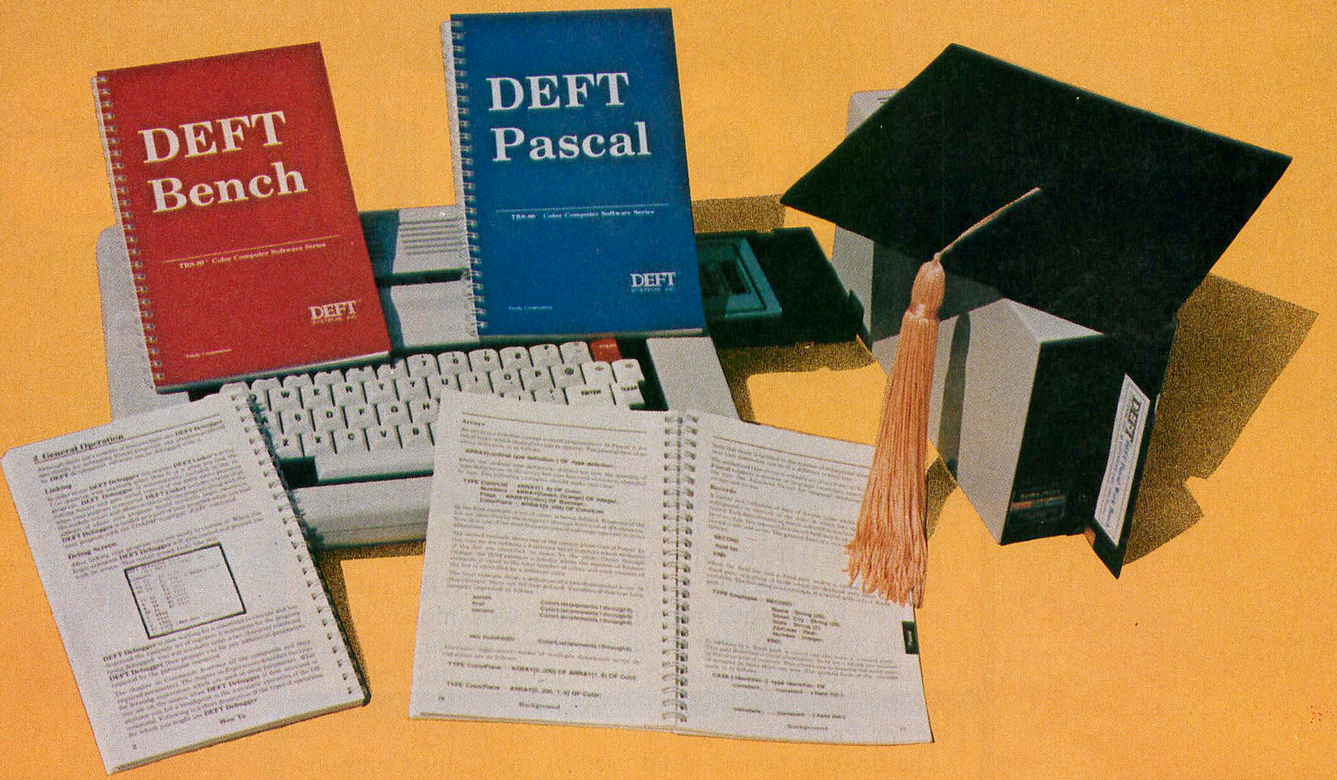
While we're talking contests, don't forget our continuing competition: The First Great Rainbow One-Liner Contest! In the September 1984 installment of this column, we introduced a standing contest. No deadlines. Few rules. Some guidelines. Well, we get new entries daily, but since many of you are just joining us, we want you to know you can enter, too. Just send us the best you can put together in one line of BASIC. We think these one-liners, several of which appear in each issue of THE RAINBOW, are a great learning aid, as well as just plain fun. It's a treat to see what can be done in just one line number. As long as new entries keep coming in, we plan to keep publishing the best of the crop. Enter as often as you like.

Repeating the guidelines. Programs must work in Extended BASIC and have only one line number. They must be entirely self-contained: no loading other programs, no calling ROM routines, no ML `POKE`s. Please don't try to "sneak in" machine language; the program must work as if typed in from a cold start. Don't pack so tightly that we can't `LIST` or `LLIST` the entire line — after all, we want to share your work with RAINBOW readers. Keep documentation to 25 words or less. Give the one-liner a title that hints at what it does. Saving it on cassette is the best way to submit your entry, and a printout helps, but provide a cover letter, too. As in any contest, packaging often makes the difference; entries penciled in on the back of a chewing gum wrapper are unlikely to fare well. Nonetheless, if you must break a rule or two, go ahead; we don't want to miss out on the world's greatest one-liner because of some arbitrary guideline. Lastly — just for the record — we'll consider your act of entering the contest as consent to publish your incomparable original. Whew, that's a lot of guidelines for a wide-open, no-deadline, ignore-the-rules-if-you-have-to contest.

I'll conclude with my usual one-liner: If you haven't sent in your entry, in the form of a subscription to THE RAINBOW, why not do so right away; our judges believe you'll declare it the top prize winner in the CoCo competition — no contest!

— Jim Reed

Graduate With DEFT Pascal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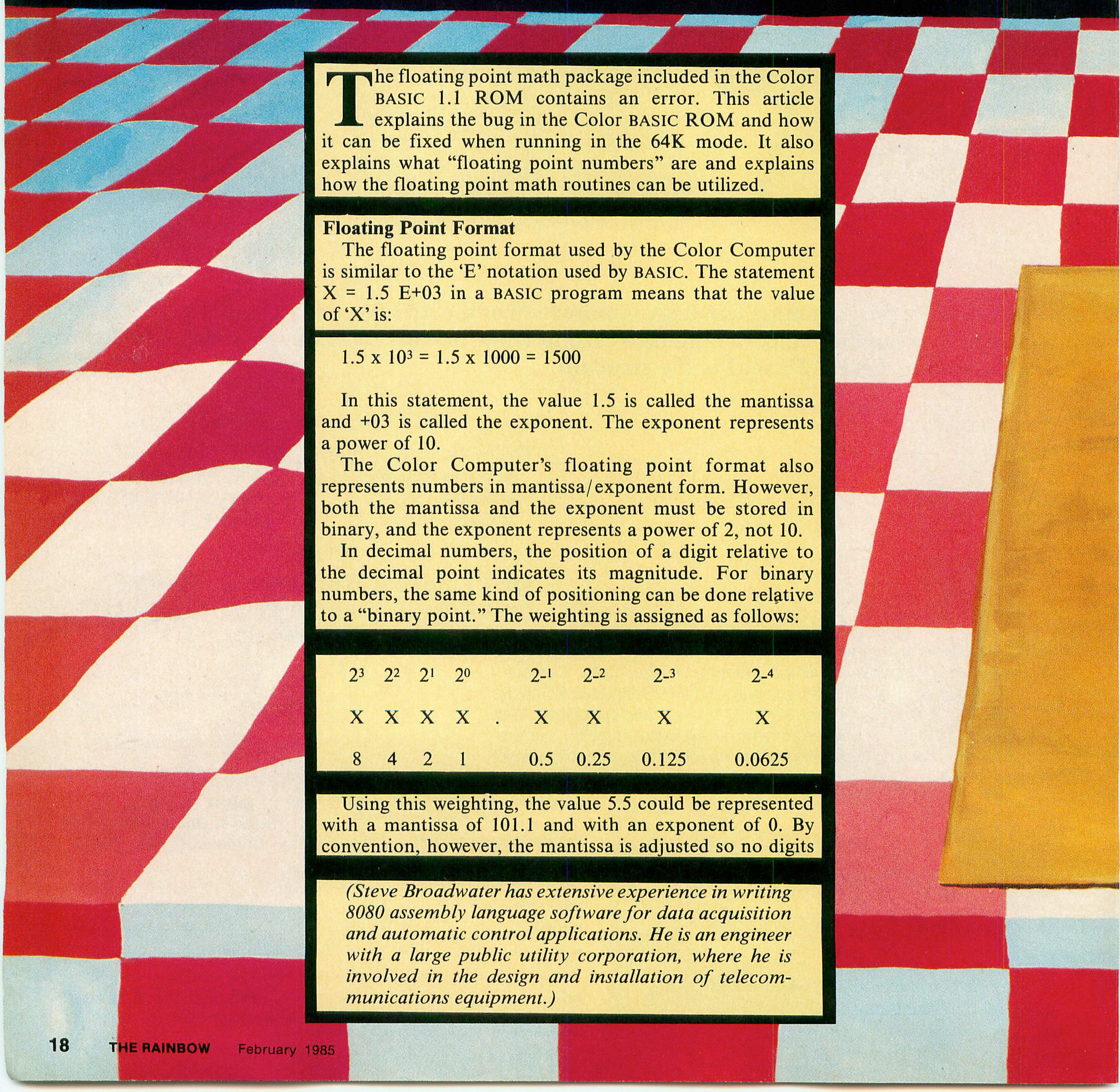
MATH TUTORIAL

FLOATING



The floating point math package included in the Color BASIC 1.1 ROM contains an error. This article explains the bug in the Color BASIC ROM and how it can be fixed when running in the 64K mode. It also explains what "floating point numbers" are and explains how the floating point math routines can be utilized.

Floating Point Format

The floating point format used by the Color Computer is similar to the 'E' notation used by BASIC. The statement X = 1.5 E+03 in a BASIC program means that the value of 'X' is:

$$1.5 \times 10^3 = 1.5 \times 1000 = 1500$$

In this statement, the value 1.5 is called the mantissa and +03 is called the exponent. The exponent represents a power of 10.

The Color Computer's floating point format also represents numbers in mantissa/exponent form. However, both the mantissa and the exponent must be stored in binary, and the exponent represents a power of 2, not 10.

In decimal numbers, the position of a digit relative to the decimal point indicates its magnitude. For binary numbers, the same kind of positioning can be done relative to a "binary point." The weighting is assigned as follows:

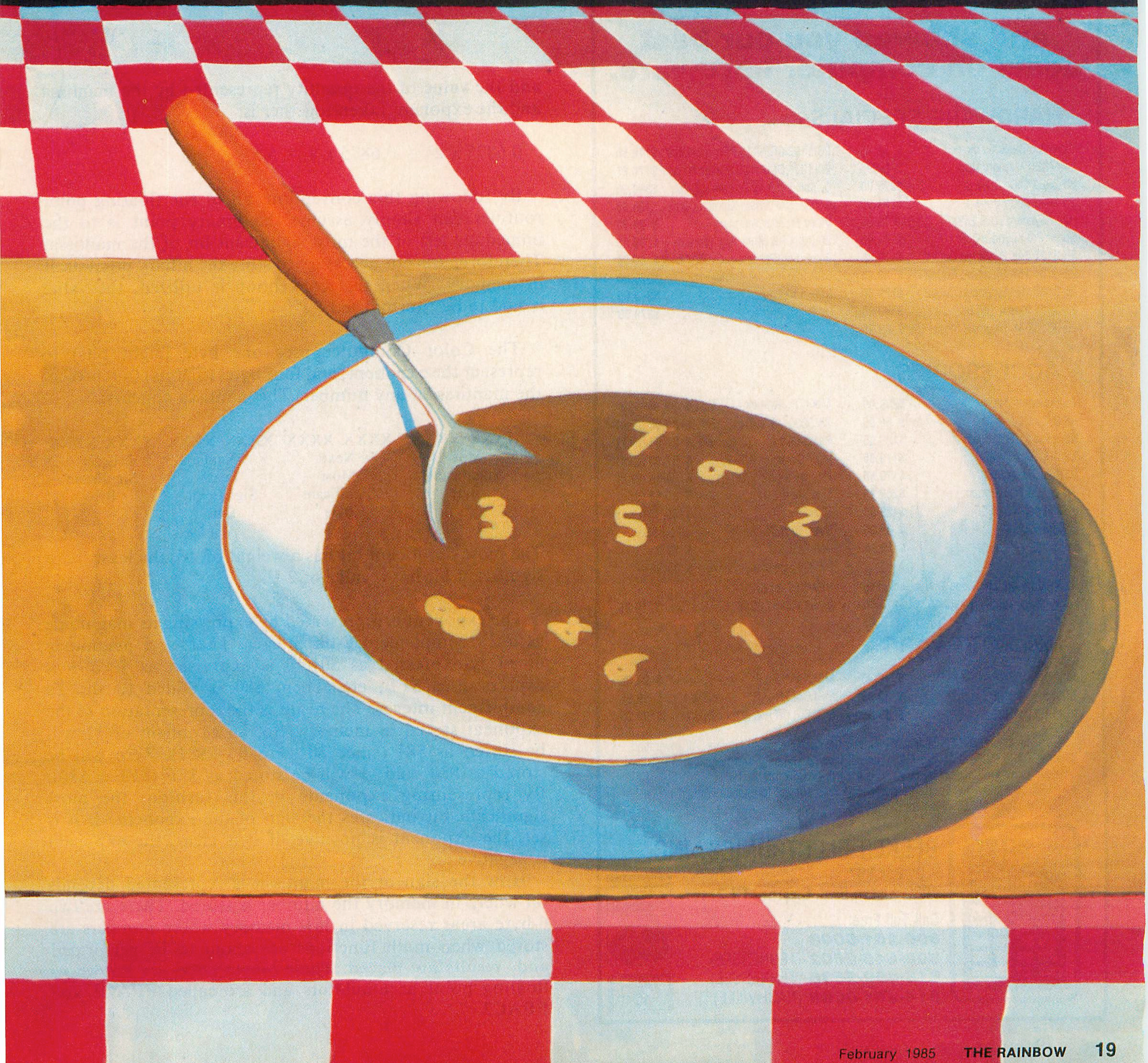
2^3	2^2	2^1	2^0		2^{-1}	2^{-2}	2^{-3}	2^{-4}
X	X	X	X	.	X	X	X	X
8	4	2	1		0.5	0.25	0.125	0.0625

Using this weighting, the value 5.5 could be represented with a mantissa of 101.1 and with an exponent of 0. By convention, however, the mantissa is adjusted so no digits

(Steve Broadwater has extensive experience in writing 8080 assembly language software for data acquisition and automatic control applications. He is an engineer with a large public utility corporation, where he is involved in the design and installation of telecommunications equipment.)

POINT MATH

By Steven R. Broadwater



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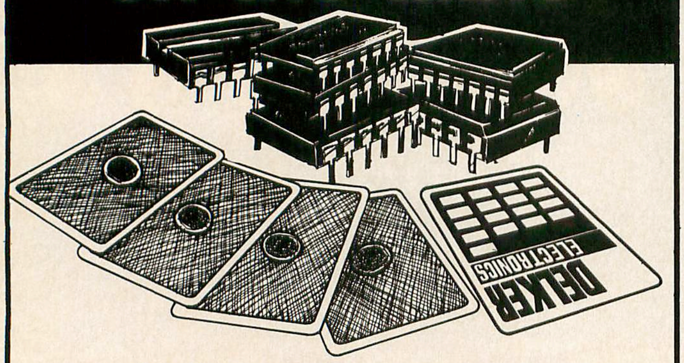

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to the left of the binary point are set and the first digit to the right of the binary point is set. The adjustment is made by rotating or shifting the mantissa to the left or right as many times as required to correctly position the most significant bit. Since rotating the mantissa once to the right is the same as dividing it by two, the exponent must be incremented by one each time the mantissa is rotated to the right, and must be decremented each time the mantissa is rotated to the left.

In this example, the mantissa becomes 0.1101 and the exponent becomes 011, or 3. This form can be seen to be equivalent in that the value of the mantissa is now:

$$
\begin{array}{lclcl}
0 \times 2^{0} & = & 0 \times 1 & = & 0 \\
1 \times 2^{-1} & = & 1 \times 0.5 & = & 0.5 \\
0 \times 2^{-2} & = & 0 \times 0.25 & = & 0 \\
1 \times 2^{-3} & = & 1 \times 0.125 & = & 0.125 \\
1 \times 2^{-4} & = & 1 \times 0.0625 & = & 0.0625 \\
\hline
 & & & & 0.6875
\end{array}
$$

and the value of the quantity represented by the mantissa and the exponent taken together is:

$$0.6875 \times 2^{3} = 0.6875 \times 8 = 5.5$$

By following this convention, all of the floating point routines can simply assume the binary point is to the immediate left of the most significant bit of the mantissa. Therefore, it is not necessary to store the binary point itself in memory. When this convention is utilized, the value is said to be "normalized."

The Color Computer uses one byte (eight bits) to represent the exponent, and four bytes (32 bits) to represent the mantissa of any number. The mantissa appears:

.1XXX XXXX	XXXX XXXX	XXXX XXXX	XXXX XXXX
Most Significant Byte	Next Most Significant Byte	Next Least Significant Byte	Least Significant Byte

The most significant bit has a weight of 2^{-1}; the least significant bit has a value of 2^{-32}.

The exponent is represented by expressing its magnitude as a 2's complement 8-bit integer. That is, a magnitude of +1 is expressed as $01, 0 is expressed as $00, -1 is expressed as $FF, etc. Then, $80 is added to the 2's complement integer. The result is the representation of the exponent stored in memory. So, an exponent of +1 will be stored as $81 (since $01 + $80 = $81). Zero will be stored as $80, and -1 will be stored as $7F ($FF + $80). By representing exponents in this fashion, the most significant bit indicates the sign of the exponent. If it is set, the exponent is positive; if it is clear, the exponent is negative.

How the sign of the mantissa is represented depends on where in memory the number is stored. There are two 6-byte areas reserved in low memory where numbers are stored when math functions are about to be performed and results are placed. These 6-byte areas are known as floating point accumulators and are called FPAC1 and FPAC2.

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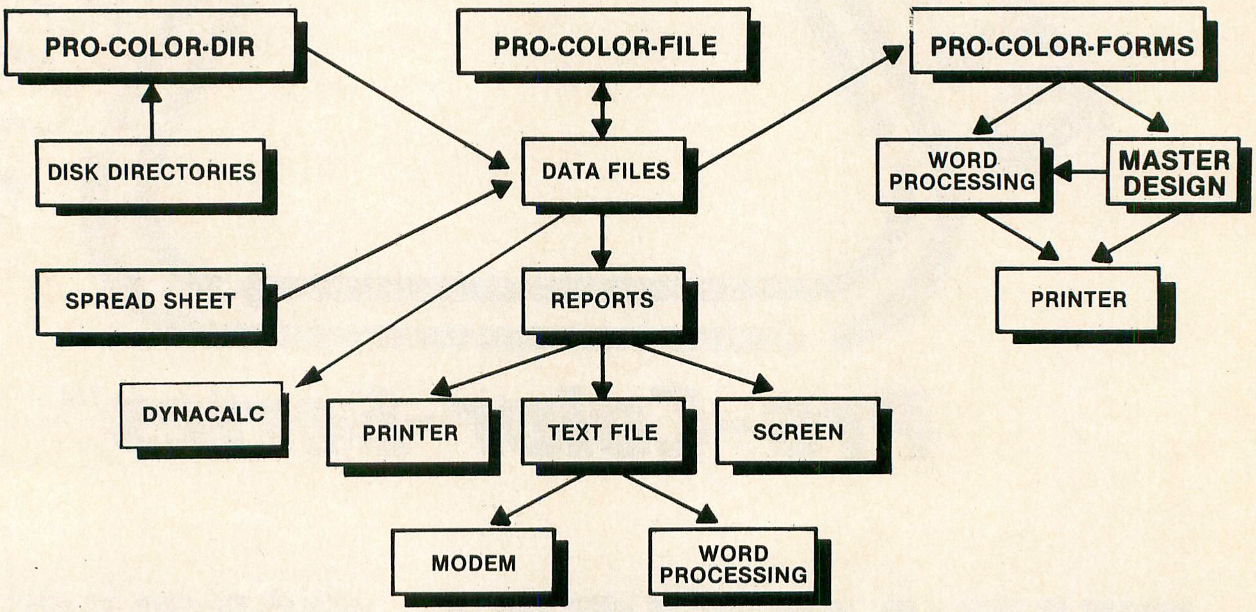
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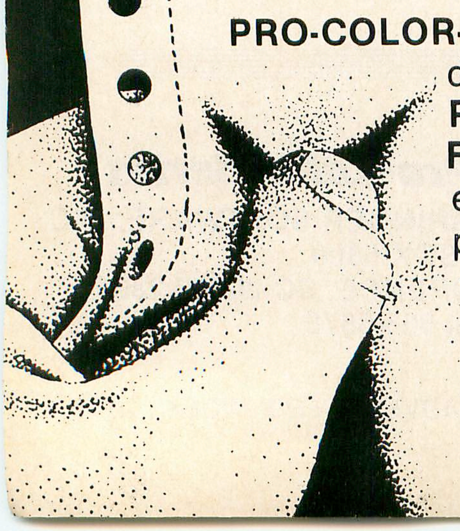

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Their locations are:

Address (Hex)		Definition
FPAC1	FPAC2	
$004F	$005C	Exponent
$0050	$005D	Mantissa — MS
$0051	$005E	Mantissa — NMS
$0052	$005F	Mantissa — NLS
$0053	$0060	Mantissa — LS
$0054	$0061	Mantissa — Sign

In the floating point accumulators, there is one byte used for the exponent, four bytes used for the mantissa, and one byte used for the sign of the mantissa. Only the most significant bit of the sign byte is used. If it is clear, the mantissa is taken to be positive; if it is set, the mantissa is negative. The other seven bits of the sign byte are meaningless. The number 5.5 stored in FPAC1 would appear as:

Address	Data Byte
$004F	$83
$0050	$0B0
$0051	$00
$0052	$00
$0053	$00
$0054	$30

The exponent $83 = 1000 0011. Since the most significant bit is set, the exponent is positive. The value of the exponent is given by $83 - $80 = +3.

The mantissa is $B0000000, or

.1011 0000 0000 0000 0000 0000 0000 0000

and has a value of 0.6875 as shown above.

The sign byte is $30 or 0011 0000. Since the most significant bit is clear, the mantissa is positive. The other seven bits in the sign byte don't matter.

BASIC reserves space in memory in which to store values of variables used in a program. However, to conserve memory, only five bytes are used to store a value anywhere in memory *except* in the two accumulators. The most significant bit of the mantissa is discarded (since it's always set), and the most significant bit of the sign byte is moved into its place. Thus, the number 5.5 stored at location $1E7D appears:

Address	Data Byte
$1E7D	$83
$1E7E	$30
$1E7F	$00
$1E80	$00
$1E81	$00

A value of -5.5 will be stored as follows:

Address	Data Byte	Address	Data Byte
FPAC1			
$004F	$83	$1E7D	$83
$0050	$0B0	$1E7E	$0B0
$0051	$00	$1E7F	$00
$0052	$00	$1E80	$00
$0053	$00	$1E81	$00
$0054	$0B0		

One special case remains to be discussed. How is the value '0' represented? At first glance, a mantissa of all zeros would appear to work, but this representation does not conform to the convention that the most significant bit of the mantissa must be set. Instead, the exponent is set to $00, and the floating point routines always assume that the value of the number is zero when the exponent is zero, regardless of the value of the mantissa.

Now that the standard or normalized format of floating point numbers is defined, the range of values that can be represented with this format can be determined. The absolute value of any number must fall in the range:

$2.9387359 \times 10^{-39}$ to 1.7014118×10^{38}

If an attempt is made to define a variable's value below the lower limit of this range, the value of the variable will be taken as zero. Violating the upper limit generates an OV Error in BASIC.

Floating Point Routines

The Color BASIC ROM contains software routines that allow addition, subtraction, multiplication and division of numbers expressed in floating point format. BASIC uses these routines, and it's also possible to use them in an assembly language program.

There are six floating point routines of interest. Their entry points (that is, the addresses where the routines begin) are listed below, together with a short description of the function of each. Each has also been assigned an arbitrary name to facilitate the following discussion. An assembly language program must either refer to a routine by using the address of its entry point, or must contain an *EQU* or *SET* statement that defines the name.

With this restriction in mind, the important routines are:

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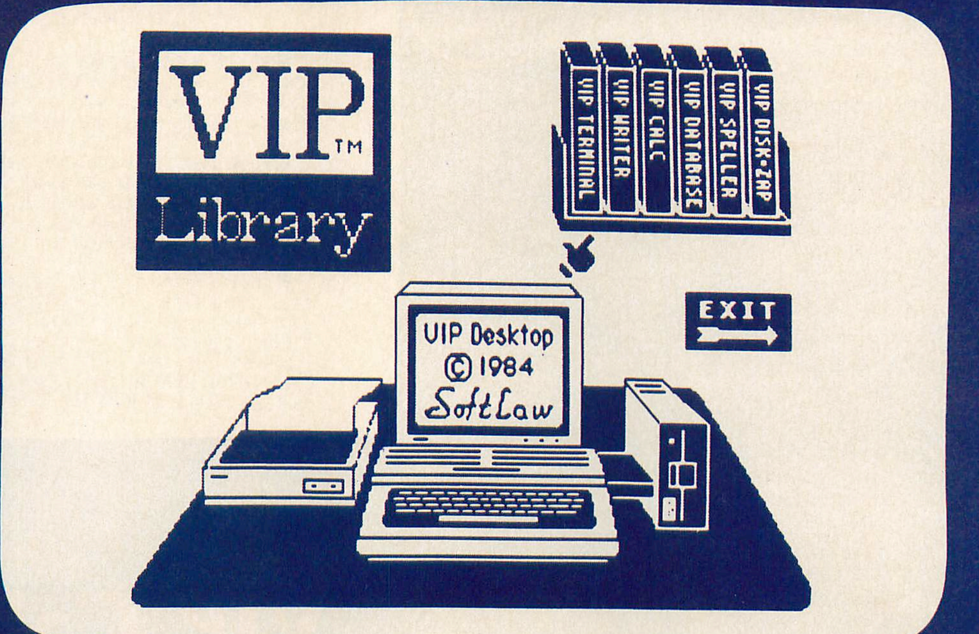

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VIP Writer™

Includes VIP Speller at no additional cost!!

By Tim Nelson

RATED TOPS IN RAINBOW COLOR COMPUTER MAGAZINE & COMPUTER USER

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By Bill Argyros

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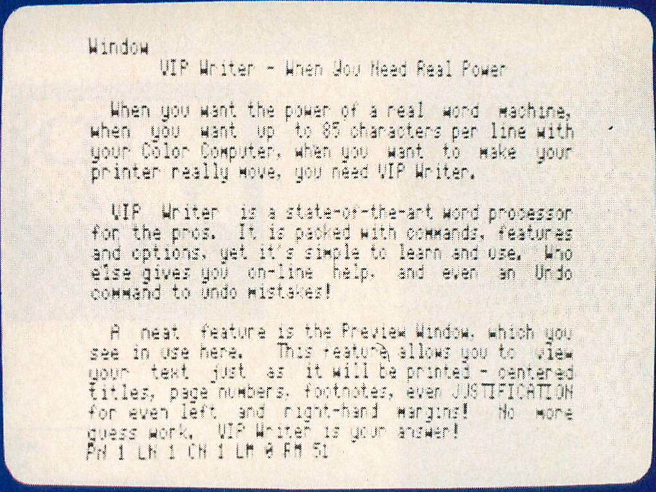

```
Window
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and options, yet it's simple to learn and use.  Who
else gives you  on-line  help.  and  even  an  Undo
command to undo mistakes!

   A  neat  feature is the Preview Window, which you
see in use here.    This feature allows you to  view
your  text  just  as  it will be printed - centered
titles, page numbers, footnotes, even JUSTIFICATION
for even left  and  right-hand  margins!   No  more
guess work.  VIP Writer is your answer!
PN 1 LN 1 CN 1 LM 0 RM 51
```

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By Kevin Herrboldt

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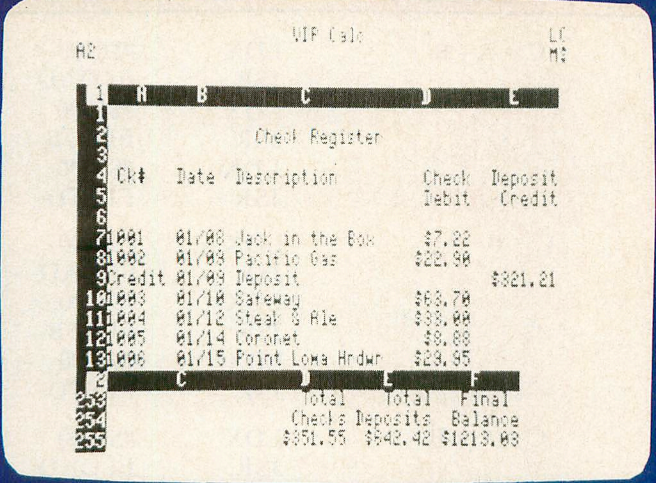
Radio Shack Catalog No. 90-0143

32K (Comes with tape & disk) $69.95

32K does not have hi-res displays, sort or edit.



```
A2                  VIP Calc                     LC
                                                 M:
 1   A      B       C          D        E
 1
 2             Check Register
 3
 4 Ck#    Date  Description         Check  Deposit
 5                                  Debit   Credit
 6
 71001   01/08 Jack in the Box      $7.22
 81002   01/08 Pacific Gas         $22.90
 9Credit 01/09 Deposit                     $321.21
101003   01/10 Safeway             $63.70
111004   01/12 Steak & Ale         $33.00
121005   01/14 Coronet              $8.88
131006   01/15 Point Loma Hrdwr    $29.95
 2             C          D         E        F
253                       Total     Total    Final
254                      Checks  Deposits  Balance
255                     $351.55   $542.42 $1213.03
```

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RATED BEST IN JANUARY 1984 "RAINBOW"

By Dan Nelson

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All versions allow tape load and save of files and KSMs, but the disk version also has the Mini Disk Operating System.

Radio Shack Catalog No. 90-0139

32K (Comes with tape & disk) $49.95

(Tape works in 16K but without hi-res displays)

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"ONE OF THE BEST" JULY 1984 "RAINBOW"

By Tim Nelson

This high speed MACHINE LANGUAGE program fills all your information management needs, be they for your business or home. And it does so better than any other database program for the Color Computer, featuring machine code, lowercase screens and mailmerge capabilities. Inventory, accounts, mailing lists, family histories, you name it, the **VIP Database™** will keep track of all your data, and it will merge **VIP Writer™** files.

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As with all other **Library** programs, the **Database** features the powerful Mini Disk Operating System.

Radio Shack Catalog No. 90-0140

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64K Required for math package & mail merge

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RAVED ABOUT IN THE APRIL 1983 "RAINBOW!"

By Tim Nelson

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16K DISK $49.95

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Name	Entry Point	Function
FLADD	$B9C2	ADD FPAC1 to X, result in FPAC1
FLSUB	$B9B9	SUBTRACT FPAC1 from X, result in FPAC1
FLMPY	$BACA	MULTIPLY FPAC1 and X, result in FPAC1
FLDIV	$BB8F	DIVIDE X by FPAC1, result in FPAC1
FLOAD	$BC14	move X to FPAC1 and modify format
FLSTO	$BC35	move FPAC1 to X and modify format

The general procedure for using the four math routines consists of three steps:

1) Place the value of one of the inputs in FPAC1 using the FLOAD routine,
2) Place the address of the exponent of the second input in the X register,
3) Jump to the desired floating point math subroutine, which will perform the operation and leave the result in FPAC1.

Since the format of a floating point number in one of the floating point accumulators is different than the format of the same number stored anywhere else in memory, both FLOAD and FLSTO automatically convert a value into its proper format. Therefore, these two routines *must* be used when transferring a number to or from either of the accumulators.

For the purposes of discussion, assume that a floating point variable called 'A' is stored at location $6000 (the address of the exponent of 'A' is $6000), and that a variable called 'B' is stored at location $6100. The values of 'A' and 'B' have been previously assigned. Suppose that 'A' and 'B' need to be added together and the result, called 'C', is to be stored at $7000. Assembly language instructions to accomplish this addition are:

```
LDX            #$6000
JSR            FLOAD
LDX            #$6100
JSR            FLADD
LDX            #$7000
JSR            FLSTO
```

The first instruction loads register X with the address of the exponent of 'A'. Then the subroutine FLOAD copies the five bytes that represent the value of 'A' into FPAC1. FLOAD also modifies the format by moving the first bit of the mantissa to the sign byte in FPAC1, and restores the most significant bit of the mantissa (always set) to its proper place.

Next, X is loaded with the address of the exponent of 'B' and the floating point addition subroutine FLADD is called. FLADD performs the addition, adjusts the exponent and mantissa of the result to normalized format, and leaves the result in FPAC1.

Finally, X is loaded with the address where the exponent of the result will be stored. The subroutine FLSTO places the most significant bit of the sign byte in the place of the most significant bit of the mantissa and copies the result to the desired location.

The other floating point math routines FLSUB, FLMPY and FLDIV are used as shown in the following examples:

```
C = A - B:          LDX       #$6100
                    JSR       FLOAD
                    LDX       #$6000
                    JSR       FLSUB
                    LDX       #$7000
                    JSR       FLSTO

C = B - A:          LDX       #$6000
                    JSR       FLOAD
                    LDX       #$6100
                    JSR       FLSUB
                    LDX       #$7000
                    JSR       FLSTO

C = A x B:          LDX       #$6000
                    JSR       FLOAD
                    LDX       #$6100
                    JSR       FLMPY
                    LDX       #$7000
                    JSR       FLSTO

C = A / B:          LDX       #$6100
                    JSR       FLOAD
                    LDX       #$6000
                    JSR       FLDIV
                    LDX       #$7000
                    JSR       FLSTO

C = B / A:          LDX       #$6000
                    JSR       FLOAD
                    LDX       #$6100
                    JSR       FLDIV
                    LDX       #$7000
                    JSR       FLSTO

FPAC1 =
A + B + C :         LDX       #$6000
                    JSR       FLOAD
                    LDX       #$6100
                    JSR       FLADD
                    LDX       #$7000
                    JSR       FLADD
```

Pay special attention to the subtraction and division examples. To obtain the desired result, 'A' and 'B' must be used in the proper order. Also note that since all four math routines leave the result in FPAC1, chained math operations are easily performed as shown by the last example.

Math Error

As previously mentioned, there is a bug in the floating point software package in the Color BASIC 1.1 ROM. It's in the floating point addition (FLADD) routine and may also be encountered when using FLSUB. Although it's not necessary to understand how the floating point math routines function internally in order to use them in an assembly language program, it would be helpful to understand a little of how the FLADD and FLUSB routines work in order to understand the bug and how to avoid it.

FLADD first moves the value that register X points to into FPAC2, changing its format as required. Then, the exponent of FPAC1 is placed in the B register and the exponent of FPAC2 is placed in the A register.

FLSUB also begins the same way. Then FLSUB simply changes the sign of the mantissa stored in FPAC1. Since

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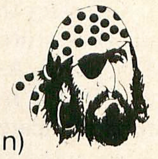

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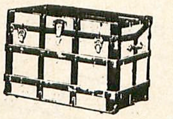

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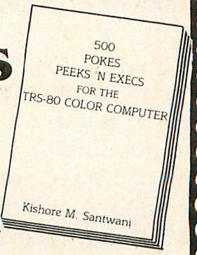

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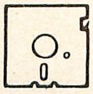

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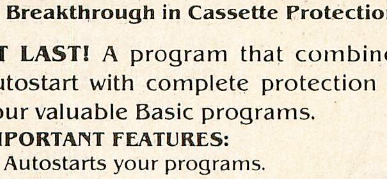

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the operation "X - Y" is the same as the operation "X + (-Y)," FLSUB can simply branch into FLADD at this point.

FLADD now checks to see if the value in either accumulator is zero. If not, FLADD is ready to add the contents of the two accumulators. In order to do the addition, the exponents of the two accumulators must be the same. When the two exponents match, all of the digits in each mantissa carry the same weight as do the corresponding digits in the other mantissa, and the 6809's ADD and ADC instructions can be employed to perform the required multi-byte addition of the two mantissas. FLADD subtracts the two exponents to see if they match; if the result is zero, the mantissas are ready to be added. If the result of the subtraction isn't zero, one of the two values must be unnormalized, that is, its mantissa and exponent must be adjusted until the two exponents match. However, FLADD runs into two problems when it tries to do the unnormalization.

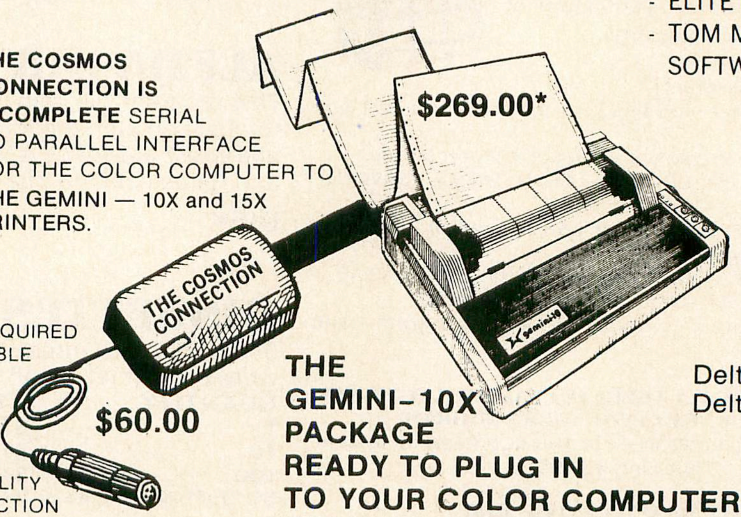
The first problem relates to the magnitude of the two values. Since a mantissa is 32 bits long, if the difference between the two exponents is more than 32, one of the two numbers is insignificant in relation to the other. FLADD doesn't consider this possibility, however; regardless of the magnitude of the difference between the two exponents, it unnormalizes one of the two mantissas. The two mantissas are added, even though one contains all zero digits. This failure to avoid unnecessary unnormalization and addition, while not causing incorrect answers to be returned, slows down the FLADD routine.

The second problem with FLADD is the bug referred to above that causes incorrect answers. FLADD uses the results of the subtraction of the exponents to determine which is larger as well as to see if the exponents initially matched. The subtraction operation automatically sets the 6809's flags based on the result, however, FLADD misinterprets the meaning of the flags.

Consider this example: The floating point representation of 31 is stored in FPAC2. The exponent of this value is $85, or +5. As seen above, FLADD subtracts the exponent of FPAC1 from the exponent of FPAC2. The following table indicates the state of the flags after the subtraction is executed over the full range of possible values of the exponent of FPAC1:

FPAC2 Exponent	— FPAC1 Exponent	= Result	Flags Set
$85	$FF	$86	N,C
. .	. .	. .	. . .
. .	. .	. .	. . .
$85	$86	$FF	N,C
$85	$85	$00	Z
$85	$84	$01	none
. .	. .	. .	. . .
. .	. .	. .	. . .
$85	$06	$7F	none
$85	$05	$80	N
. .	. .	. .	. . .
. .	. .	. .	. . .
$85	$01	$84	N

The result of the subtraction is used to determine which accumulator contains the higher number. A BMI



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instruction is used to make the distinction; that is, branch if the 'N' flag is set. FLADD should execute the branch only when the value in FPAC1 is larger than the value in FPAC2. Thus, the branch should be executed only when the exponent of FPAC1 is between $86 and $FF inclusive. In the table above, the 'N' flag is set when FPAC1 is, in fact, larger. *However*, the 'N' flag is also set when FPAC1 is very small.

When BASIC attempts to find the value of the expression "31 - 1E-38," it returns an answer of -1E-38. The exponent of 1E-38 is $02. From the table, the 'N' flag will be set when the exponents are subtracted and the branch instruction will be executed when it shouldn't be. In other words, the Color Computer incorrectly identifies 1E-38 as being larger than 31. On the other hand, when BASIC attempts to evaluate the expression "31 - 1E-37," it correctly returns an answer of 31. Since the exponent of 1E-37 is $06, the 'N' flag is not set when the exponents are subtracted and the branch instruction is not executed.

Note that it's the magnitude of the difference of the exponents that's the problem, not the magnitude of either of the two numbers taken alone. This BASIC will also respond with incorrect answers when asked to evaluate "2.5E+21 - 1.2E-18" or "2.5E+37 - 1.2E-01."

The table above demonstrated both the problem and its solution. While the 'N' flag is not a reliable indication of which of the exponents is larger, the 'C' flag is set only when the FPAC1 exponent is higher. Therefore, the bug can be fixed by changing the BMI instruction (op code $2B) at $B9D6 to a BCS (branch if 'C' flag is set) instruction (op code $25). A *POKE* instruction won't work since this address is in ROM. However, in a Color Computer with 64K RAM chips, the BASIC ROMs can be copied into RAM at the same addresses, the ROMs can be turned off, and then the bug can be fixed.

The following routine illustrates how this can be accomplished:

```
        ORG     $7C00
START   ORCC    #$50        MASK IRQ & FIRQ
        LDX     #$8000      X => 1st EXTEND BASIC
LOOP    LDA     ,X          A = ROM CONTENTS
        STA     $FFDF       GO TO MAP TYPE 1
        STA     ,X+         COPY BYTE TO RAM
        STA     $FFDE       GO TO MAP TYPE 0
        CMPX    #$C000      END OF COLOR BASIC?
        BNE     LOOP        NOT YET — DO NEXT BYTE
        STA     $FFDF       TURN ROMS OFF
        LDA     #$25        OP CODE FOR BCS
        STA     $B9D6       REPLACE BAD INSTRUC-
                            TION
        ANDCC   #$AF        UNMASK IRQ AND FIRQ
        SWI
        END
```

The newer Color BASIC 1.2 ROM fixes the bug in the same way. The byte at $B9D6 has been changed from $2B to $25. Those who have the newer ROM can rest assured their Color Computers won't give wrong answers when adding or subtracting. However, the process will still take longer than it should.

For those wishing further information, the February 1982 issue of the *Color Computer News* contains a "Comment Corner" feature written by Mr. Andrew Phelps of the Micro Works. It consists of comments that can be used with a disassembly of the floating point routines to explain how they function internally. His article was very helpful and I recommend it highly.

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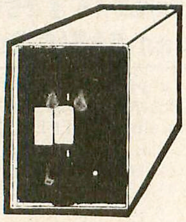

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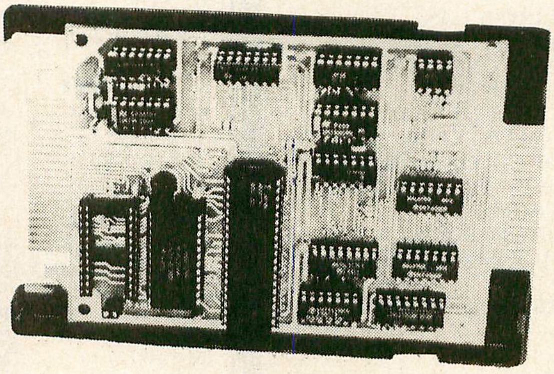

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By Paul Wagorn

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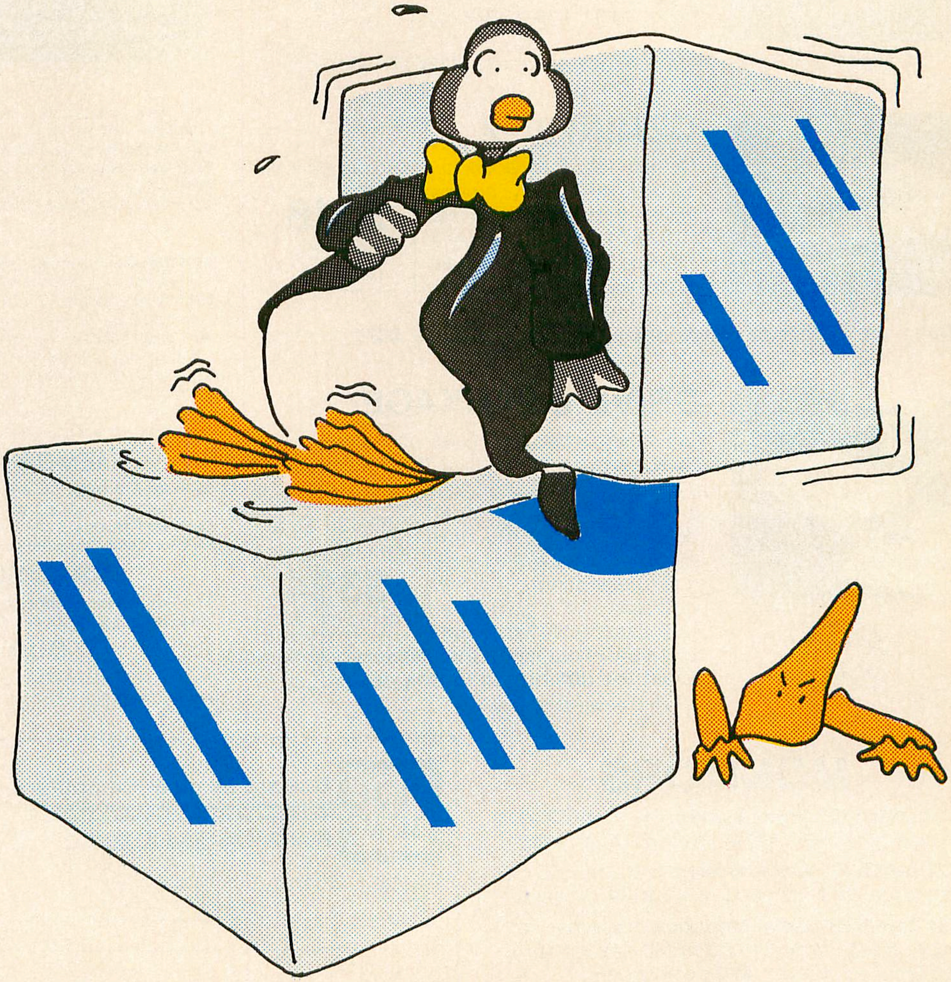

(Paul Wagorn, a senior at Earl of March High School in Carp, Ontario, is a self-taught CoCo enthusiast. He enjoys writing games and practical programs.)

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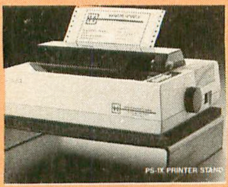

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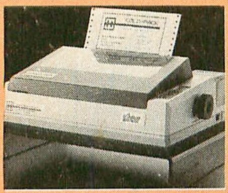

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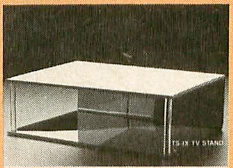

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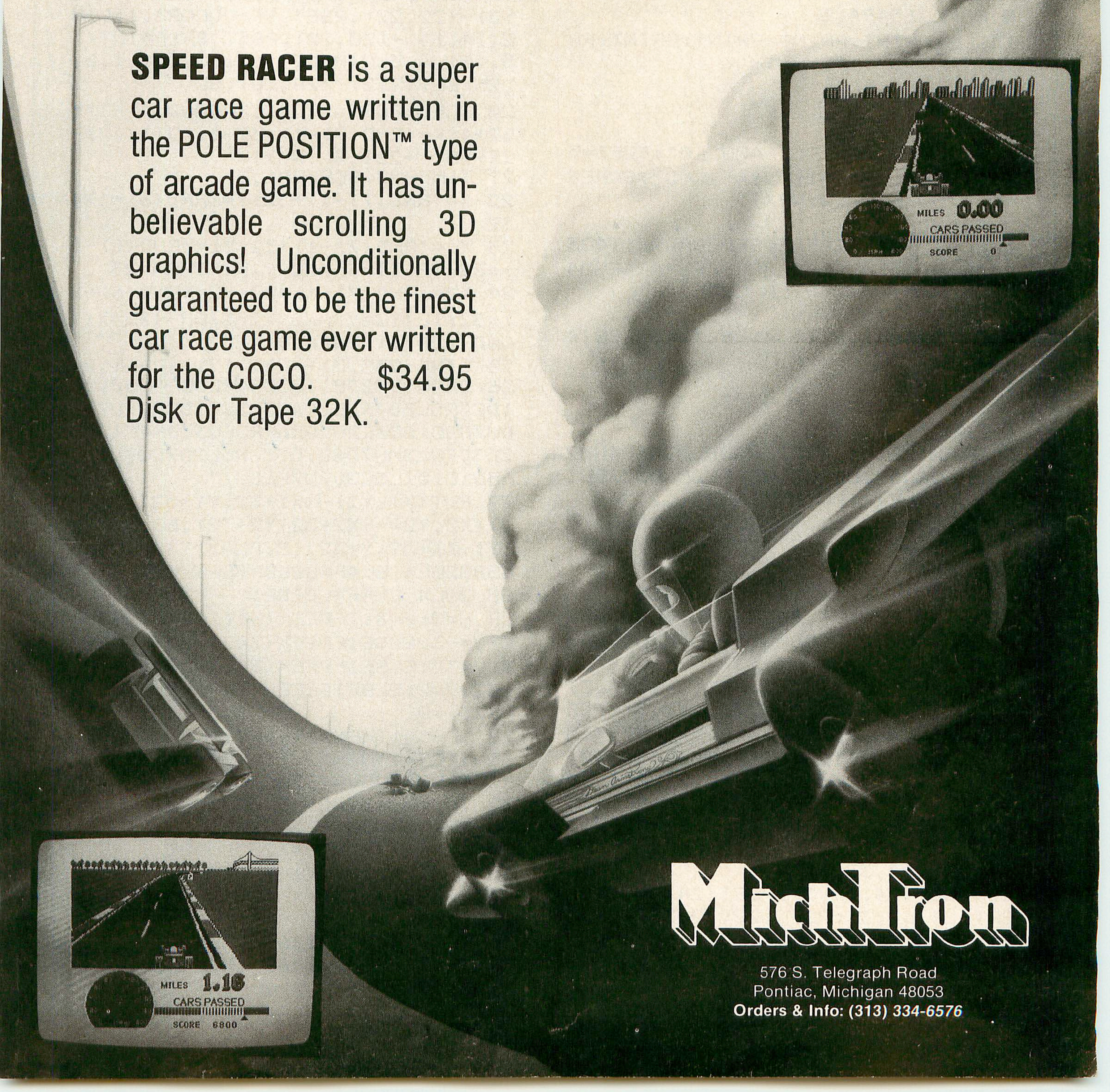
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coneheads lined up on that wall are temporarily stunned, giving you time to squash the innards out of them.

One conehead is better than the other; he moves faster, doesn't have to rest as long after eating an ice block, and stays stunned for less time than the inferior conehead (not the kind of guy you'd want to meet in a dark alley!).

The speedup *POKE* is used in Line 7, so if your computer hangs up with the speedup *POKE*, take it out.

I hope you have as much fun playing *Penguin* as I do. One more thing: good luck, you'll need it!

12	74
21	215
35	97
51	133
70	239
END	47

The listing:

```
0 POKE 65494,0
1 CLS:PRINT:PRINT:PRINT:PRINT:PR
INT"           PENGUIN

                  BY

                       APOLLO":FORI=5
9TO100:PLAY"T=I;O5;A-;C;D":SCREE
N0,1:SCREEN0,0:NEXTI
2 PLAY"O3"
3 PLAY"T4;CAGAFAEADFDEGADAP1T4O3
L4AP14L2AL4GFL4CL3CL4DFB-AP4FGO4
L4DCO3AB-AAGL3B-L8AL2F"
4 CLEAR3,16383
5 DIMB(4,4),BG(4,4),BL(3,3),SG(4
,4),DB(3,3)
6 COLOR3,1
7 POKE65495,0:
8 PMODE1,1:PCLS
9 DRAW"S8BM4,14C2FR3URLD2R4L4UH2
F2DR2U4D4R2UE2G2LRDR3EDC1D5C3DGL
10HUE3R6F3":PAINT(18,26),2,3
10 PSET(13,26,3):PSET(15,26,3):P
SET(20,27,3):PSET(22,27,3):PSET(
18,28,4)
11 GET(2,2)-(32,32),SG:PCLS
12 DRAW"S8BM14,4C2R3F3D7GL7HU7E2
G3C3D4GU4GD5C1DBM+13,0U4C3U4FD4F
U4"
13 PAINT(16,8),2,2:PSET(14,10,3)
:PSET(14,12,3):PSET(20,10,3):PSE
T(20,12,3):PSET(16,16,3):PSET(18
,16,3):PSET(12,18,4):PSET(14,20,
4):PSET(16,20,4):PSET(18,20,4):P
SET(20,20,4):PSET(22,18,4):PSET(
8,28,3):PSET(8,30,3):PSET(8,32,3
):PSET(6,32,3)
14 PSET(4,32,3)
15 PSET(24,28,3):PSET(24,30,3):P
SET(24,32,3):PSET(22,32,3):PSET(
26,32,3):PSET(28,32,3):PSET(10,3
2,3)
16 GET(2,2)-(32,32),B
17 PCLS:DRAW"S8C3BM16,8R2F3DFDFD
G2L8H2UEUEUE3LC1L5D11R5C4DL3R5C1
RC4R4L3U":PAINT(18,20),2,3:PSET(
14,18,4):PSET(22,18,4):PSET(12,2
4,3):FORI=14TO22:PSET(I,22,3):NE
XT:PSET(24,24,3)
18 GET(2,2)-(32,32),BG
19 PCLS:COLOR3,1:LINE(8,8)-(26,2
6),PSET,BF:COLOR2,1:LINE(10,10)-
(24,24),PSET,B:COLOR4,1:LINE(12,
12)-(22,22),PSET,BF:COLOR3,1:LIN
E(14,14)-(20,20),PSET,BF:PAINT(1
5,15),4,3:CIRCLE(16,16),3,1,1,0,
.25:GET(2,2)-(28,28),BL
20 PCLS:FORI=1TO47:Y=(RND(6)-1)*
32+4:X=(RND(7)-1)*32+4:PUT(X,Y)-
(X+28,Y+28),BL:NEXT
21 TIMER=0:SCREEN1,0
22 X=(RND(7)-1)*32:Y=(RND(6)-1)*
32
23 X1=(RND(7)-1)*32:Y1=(RND(6)-1
)*32:IF X1=X AND Y1=Y THEN 23
24 X2=(RND(7)-1)*32:Y2=(RND(6)-1
)*32:IF(Y2=Y AND X2=X)OR (X2=X1
AND Y2=Y1) THEN24
25 LINE(235,0)-(255,191),PSET,B
26 DRAW"BM238,18C3R4FD3GL4U5D10C
1DC3R5L5D4R2L2D4R5L5DC1DC3D7U7F6
DU7D8C1DC3L2GLGD6FR3EU3L3R4C1D8L
2C3D7GL3HU7D8C1D3C3R5L2D7LU7D7L2
R5D1C1D1L5C3D7U7F6DU7"
27 PUT(X1,Y1)-(X1+32,Y1+32),BG:P
UT(X2,Y2)-(X2+32,Y2+32),BG:PUT(X
,Y)-(X+32,Y+32),B:PLAY"T3O1;L4EL
8GBO2GL4.EL4F#L8EDP8DP8P8O1L4EL8
GBO2GL4.EL4F#L8EDP1"
28 H=0:V=0:IFPEEK(341)=247THENH=
0:V=-32ELSEIFPEEK(342)=247THENH=
0:V=32:ELSEIFPEEK(343)=247THENH=
-32:V=0:ELSEIFPEEK(344)=247THENH
=32:V=0
29 IFG1=1THENX1=-1:Y1=-1
30 IFG2=1THENX2=-1:Y2=-1
31 IFY=0ANDV=-32GOSUB80
32 IFY=32*5ANDV=32GOSUB80
33 IFX=0ANDH=-32GOSUB80
34 IFX=6*32ANDH=32GOSUB80
35 IFX1=X AND Y1=Y ANDG1<>1 THEN
 63 ELSE IF X2=X AND Y2=Y ANDG2<
>1 THEN 63
36 IF TIMER>=40*60 THEN 63
37 IF TIMER>=30*60 THEN PLAY"T25
5;O3;1;7"
```

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For fun, (and this requires no ML experience), use Peeper with arcade games, watching the fine details of the animation effects in slow motion. See how the game looks and plays in other graphics modes. Or watch what is happening on "hidden screens" you never see. (Makes a superb demonstration.)

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```
38 A=X+16+32*SGN(H):B=16+Y+32*SG
N(V)
39 IFPPOINT(A,B)=3 GOSUB56
40 IFPPOINT(X+H+16*SGN(X),Y+V+16
*SGN(Y))=2 ANDH<>0 AND V<>0THEN
63
41 IFX+H>=200ORH+X<0ORV+Y>=180OR
V+Y<0THENH=0:V=0
42 LINE(X,Y)-(X+32,Y+32),PRESET,
BF:X=X+H:Y=Y+V:PUT(X,Y)-(X+32,Y+
32),B
43 IFG1=1ANDG2=1THEN74
44 IF F1<0 THENF1=F1+1:GOTO50
45 IFG1=1THEN50ELSEIFH1=-1THENH1
=0:GOTO28ELSEH1=(RND(3)-2)*32:V1
=(RND(3)-2)*32:H2=(RND(3)-2)*32:
V2=(RND(3)-2)*32
46 IFX1+H1>=200ORX1+H1<0ORV1+Y1=
>190ORV1+Y1<9THEN50
47 IFPPOINT(X1+16+32*SGN(H1),16+
Y1+32*SGN(V1))=3 THENF1=-4
48 LINE(X1,Y1)-(X1+32,Y1+32),PRE
SET,BF:X1=X1+H1:Y1=Y1+V1:PUT(X1,
Y1)-(X1+32,Y1+32),BG
49 IFX1=X ANDY1=Y THEN63
50 H2=(RND(3)-2)*32:V2=(RND(3)-2
)*32:IFG2=1THEN28ELSEIFF2<0THENF
2=F2+1:GOTO28
51 IFX2+H2>=200ORX2+H2<0ORV2+Y2>
=32*6ORV2+Y2<0THEN28
52 IFPPOINT(X2+16+32*SGN(H2),16+
Y2+32*SGN(V2))=3THENF2=0
53 LINE(X2,Y2)-(X2+32,Y2+32),PRE
SET,BF:X2=X2+H2:Y2=Y2+V2:PUT(X2,
Y2)-(X2+32,Y2+32),BG
54 IFX2=X ANDY2=Y THEN63
55 GOTO 28
56 SC=SC+20:PLAY"T255;V31;O1;1;3
;;O4;1;5;3;2;4":XB=X+H:YB=Y+V
57 IFYB=0ANDH=0THENRETURN
58 IFYB=>32*5ANDV=32THENRETURN
59 IFXB=0ANDH=-32THENRETURN
60 IFXB=>32*6ANDH=32THEN RETURN
61 I=PPOINT(XB+16+32*SGN(H),YB+1
6+32*SGN(V)):IFI=3THEN RETURN:EL
SEIFI=2THEN 67
62 LINE(XB,YB)-(XB+30,YB+30),PRE
SET,BF:XB=XB+H:YB=YB+V:PUT(XB,YB
+4)-(XB+30,YB+30),BL:GOTO57
63 PLAY"O1T255;1;1;1;1;1;2;2;2;2
;3;3;3;4;4;4;5;5;6;6;7;8;9;12;O2
;1;4;7;9;12;O3;1;5;8;12;O4;1;6;1
2;O5;1;12;T3;O1;L4;DD;L8;D;L3;D;
L4;F;L8;E;L4;E;L8;D;L4;D;L8CL2D"
:CLS:PRINT"SCORE      :"SC:IFSC=>H
S THEN HS=SC
64 PRINT:PRINT:PRINT"HIGH SCORE
 :"HS:PRINT:PRINT:PRINT"LEVELS C
OMPLETED   :"LE
65 A$=INKEY$:PRINT"PRESS ANY KEY
 TO PLAY AGAIN"
66 PLAY"T255;O1;1;2;3;4;1;2;3;4;
1;2;3;4;1;2;3;4;5;6;7;8;9;8;7;6;
5;4;3;2;1;2;3;4;5;6;7;6;5;6;7;6;
5;6;7;8;9;7;5;3;1;1;1":IFINKEY$=
""THEN66ELSESC=0:G1=0:G2=0:LE=0:
GOTO6
67 SC=SC+200:A=XB+32*SGN(H):B=YB
+32*SGN(V)
68 IFA=X1 AND B=Y1 THEN G1=1:ELS
EG2=1
69 IFA=X1 ANDB=Y1 THENPUT(X1,Y1)
-(X1+32,Y1+32),SG:ELSEPUT(X2,Y2)
-(X2+32,Y2+32),SG
70 PLAY"T255V31O1;1;1;1;2;2;2;3;
3;3;4;4;4;5;5;6;6;7;8;8;9;10;11;
12;O2;1;2;3;4;5;6;7;8;9;10;11;12
;O3;1;3;5;7;9;11;12;O4;1;5;9;12;
O5;1;12"
71 LINE(A,B)-(A+32,B+32),PRESET,
BF:PUT(A,B+4)-(A+30,B+30),BL
72 LINE(XB,YB)-(XB+32,YB+32),PRE
SET,BF
73 GOTO28
74 T=TIMER:PLAY"T255;O5;12;12;12
;12;10;10;10;9;9;9;8;8;8;7;7;7;6
;;;6;6;5;4;3;2;1;O4;12;10;9;8;7;
6;5;4;3;2;1;O3;12;10;8;6;4;2;1;O
2;12;8;4;1;O1;12;1"
75 CLS:PRINT@0,SC:PRINT@32*8,"LE
VELS COMPLETED   :"LE+1:LE=LE+1:F
ORI=1TO40-T/60:T=T+60:SC=SC+10:P
RINT@128,"TIME LEFT:"INT(40-T/60
):PRINT@0,"SCORE:        "SC:PLAY"T
255O2;1;3;4;3;6;7;7;8":NEXT
76 PLAY"P4;O2T3;L8;BBBABABO3DO2B
L4ABP8L8BBBBBBAGAGL4BP4P8L8BAGED
L4EL8EEF#EDO1BO2L4DEL8GEP2L4EL8F
#D"
77 A$=INKEY$:PRINT@360,"PRESS AN
Y KEY"
78 IFINKEY$=""THEN78
79 SCREEN1,0:G1=0:G2=0:SC=SC+500
:TIMER=0:GOTO 20
80 PLAY"T255O2;1;3;5;7;9;7;5;3;1
;3;5;7;9;7;5;3;1;3;5;7;9;7;5;3;1
;1;1;3;4;1;2;3;4;3;2;1;2;3;4;1;1
;1;1;1":IFH=0THEN84
81 IFX1=X THENF1=-10:PUT(X1,Y1)-
(X1+32,Y1+32),SG
82 IFX2=X THENF2=-5:PUT(X2,Y2)-(
X2+32,Y2+32),SG
83 GOTO41
84 IFY1=Y THENF1=-10:PUT(X1,Y1)-
(X1+32,Y1+32),SG
85 IFY2=Y THENF2=-5:PUT(X2,Y2)-(
X2+32,Y2+32),SG
86 GOTO41
```

A Guide To The Do's And Don'ts Of Modeming

By Wayne Day
Rainbow Contributing Editor

By the time you read this, likely all of the Christmas presents will have begun to get a lot of usage, especially if a modem or a new terminal program had been hung in the stocking!

Quite a few new users will have shown up on CompuServe's Color SIG (Special Interest Group), where I serve as the systems operator (SYSOP), and they will begin to learn about the "new" world of telecommunications.

So now might be a good time to review some of the "do's" and "don'ts" of modeming.

First off, get familiar with your equipment and software setup. Knowing your hardware and software capabilities, and limitations, will save you valuable connect time, which is even more important if you're calling long distance or connected to one of the commercial information services.

(Wayne Day, a traffic engineering signal technician, is the SYSOP of The Color SIG of CompuServe, the world's largest consumer information service. He is also a certified paramedic and works part-time for an Emergency Medical Service provider. His amateur radio operator call sign is WA5WDB.)

Read the documentation that comes with the software, paying special attention to instructions on how to capture data (if your software supports that function).

For example, some programs require you to open a buffer manually in order to save anything you receive online, while others allow the host system (the computer you're calling) to open and close your receive buffer automatically. This latter method is known as "capture characters" since the host sends a particular character to your software, telling it to start "capturing" the data that follows.

> ***". . . get familiar with your equipment and software setup. Knowing your hardware and software capabilities, and limitations, will save you valuable connect time . . ."***

On other terminal programs, however, you need to defeat word-wrap and high resolution character screens prior to capturing data in the buffer. Again, the point is to read those instructions very carefully.

Knowing the operating hours of those BBSs is important, since it might save you a long distance phone call if the system is unavailable. In November, we listed a group of 92 known BBS systems that were of special interest to the CoCo user, and this month we bring you an update, bringing the total up to 115 operating BBS systems.

Other "Do's" to remember:

If you're calling a single-user BBS, be considerate of other users and don't dawdle on the system unnecessarily. Others may be waiting to call (and, you might wind up having to wait sometime).

Make note of any message content policies that the SYSOP may establish, and abide by his wishes. Some BBSs restrict commercial messages and others prohibit them entirely. Ditto on "adult" language.

On the other hand, there are the "don'ts:"

Don't try to "crash" the system, just to see if it can be done; robbing others of the chance to use a BBS is pretty childish. Since most BBS systems make a note in the user log each time someone logs on, you may find that you're no longer welcome on the board next time.

Don't ask folks to help you out with something, and expect them to be mind readers. Asking a question like "I wrote a program and it doesn't work. Why?" doesn't give anyone enough information to work with. The more information you can put in a question, the better your chances for a good answer!

Don't forget to read all of the messages on a BBS system. Quite often you'll stumble across some piece of obscure information that will really save the day — two weeks later!

And finally, don't forget to have plenty of paper and a pencil nearby to take notes on other BBS systems that you might be interested in, as well as a place to jot down that neat little poke everyone's been talking about!

Whew!

Letters, Letters, Letters

Q: Is it possible to allow another CoCo user to call up my modem, then let him store programs on my disk drives, and use my printer? The reason I ask is that many students at the university I am attending could benefit from a service such as this, while I could make some spare money.

A: Sure, it's possible ... that's basically what services such as The Source and CompuServe do — allow you to use *their* computer and disks.

On a CoCo, you'd need an auto-answer modem (to answer your phone automatically and connect it to the computer), as well as a remote terminal driver, such as *REMOTERM* (sold by Star-Kits) or Dan Downard's *REMOTE.BIN*, published in THE RAINBOW in November 1984.

The remote terminal driver basically lets the person calling in on the modem act as if he were sitting at the keyboard of your computer; all of the data he types on his terminal is the input to your computer, and all of the output from your computer goes to his terminal.

There are some limitations, though. Graphics screens cannot be displayed in this manner, since you will be limited to using the normal ASCII character set (*CHR$ 0-127*). Additionally, any programs that use *PRINT@* statements must be converted to normal *PRINT* statements, since there is no way to control the other user's cursor or screen position. That also means that a *CLS* won't work, either.

If you're setting up something like this with a friend, there's no problem since you know who it is that has control over your computer. Remember, though, that since he acts like he's sitting at your keyboard, he can even do a *DSKINI* and wipe out all your disks!

Therefore, if you're going to be doing this with more than one person, or providing the service commercially, consider the security requirements you'll have to make:

For example, user 'A' should not have access to user "B's" files, to protect confidentiality.

No user should be able to harm the system itself. That means you'll have to provide some way to protect against a *DSKINI* or *POKE* into the wrong place, and that usually means a remote time-sharing monitor, such as the *TSMON*, part of the Radio Shack OS-9 Operating System.

> ***"The remote terminal driver basically lets the person calling in on the modem act as if he were sitting at the keyboard of your computer . . ."***

Q: Your column ("CommLink", October 1984) made the first mention I've ever seen of using a party line for data transmissions. How disastrous is it if someone else on the line picks up the phone? Can they tell something is going on, or will they try to call a repairman to fix the funny noises?

A: There's a two-fold answer to this question: a practical one, and a legal one. First, the legal considerations.

Consider this scenario: It's 2 a.m., and you've finally gotten in to that popular BBS on the West Coast. You've got a lot of downloading to do, and waiting for your chance on the BBS has been a drag.

About halfway through your first download, your neighbor, the one on your party line, is awakened by the smoke detector in his house — he has a fire, and obviously needs to call the fire department, but can't. It seems there are some funny noises on the phone line.

Far-fetched? Possibly, but not too far-fetched.

The simple fact is that all states have laws that require you to hang up the receiver of a party line immediately when told the line is needed for an emergency call to a fire department, or police department, or for medical aid. In Texas, it's an offense that brings a fine of not more than $500 or imprisonment for a term not exceeding one month, or both (Southwestern Bell Telephone Company Phone Book, 1984).

If you're online, the chances are you won't hear someone on a party line picking up the telephone.

Direct-connect modems must be registered with the Federal Communications Commission, and the F.C.C. restricts direct-connect modems to the extent that they may not be connected to a party line or pay telephone.

Thus, two big reasons why a party line can be hazardous to your modeming health.

Let's consider a one-party line, where someone picks up an extension telephone in some other part of the house.

Depending on what you are doing (downloading using an error-correction protocol like XMODEM or just sending and receiving straight ASCII data), someone picking up one of the other phones in your house can have from a slight to a disastrous effect on your telecommunications session.

From personal experience, there have been times when someone else picked up a phone in my house, and I never knew it (our neighbor still wonders about those funny tones on our line!).

During testing of a new terminal program that uses the XMODEM protocol, we have picked up the phone and shouted into it, played music into it, and generally banged it around, with no ill effects other than causing an error in the transmission of the current packet of information, which was re-sent and received OK after we quit trying to goof it up.

Other times, though, before the installation of the computer's own phone at my house, I've been bumped off by someone picking up the phone — blew me completely off the system I was talking to.

So, it's an iffy situation; sometimes it won't harm anything, and other times it's bad news.

The ultimate solution might be to have a second line installed if modem use and more normal telephone usage conflicts crop up. It's been a lifesaver (mine) at my house!

Two Questions, One Basic Answer

Q: I called one of the numbers you

listed in the BBS Roundup *(The Rainbow*, November 1984) and got a message saying that the number had been disconnected. Can't you keep up with the numbers you list?

Q: How come you didn't list any of the Coco BBSs in my area?

A: Let's kill two birds with one stone here, and explain a bit about how I go about collecting the BBS numbers published with this column.

Since no one can be everywhere at one time, it's only possible to list the BBS phone numbers that we become aware of, usually through messages on the Color SIG on CompuServe, on other BBSs, and in letters to THE RAINBOW.

Likewise, if a BBS goes out of business, we usually don't hear about it until someone writes in, or leaves us a message saying "you blew it!"

Therefore, we need your help in making the BBS listings in THE RAINBOW the most accurate and up-to-date that we can. If there's a CoCo BBS in your area, let us know about it. If one goes off-line, you could also drop us a line to let us know.

Every couple of months, we'll try and publish a list of revisions such as the one included at the end of this month's column to keep you up to date. Additionally, I maintain a current list in the SIG's database on CompuServe, so CompuServe subscribers can get the whole shooting match at one time. That list is usually updated at least monthly.

Before I put a BBS on the list, I call it to make sure that, indeed, there is a BBS there, that our information is correct, and that the BBS is open to the public.

Some Random Thoughts

John Lovell, the SYSOP of The CIC BBS in Miami, has a series of modifications to the *Bee Color BBS* program, and he's making arrangements to make those changes available to SYSOPs who are already running the *BEE* program. Give his BBS a call (305 751-6809) if you're interested in knowing more.

If you're a new user to CompuServe, you might find yourself baffled by the hundreds of things you can do on the system. Well, there's a book written just for you, *How to Get The Most Out of CompuServe* (Bantam Books, New York, $12.95). The authors, Charles Bowen and Dave Peyton, are SYSOPs on two of CompuServe's Special Interest Groups, and have compiled the most comprehensive sourcebook for CompuServe users yet. It's available at most book stores, or directly through CompuServe (Go PCS-54).

February In Irvine

I hope you've made your plans to be at the RAINBOWfest in Irvine, Calif., February 15-17 at the Irvine Marriott Inn, because I'd like the chance to meet you, spread a little bit of gossip, and hear from you as to how I can best serve you through this column.

It will be my privilege to host two seminars during RAINBOWfest: the first one on "Exploring CompuServe and The Color SIG," and the second one dealing with "Local BBS Systems" and how the Coco user, and SYSOP alike, can get the most out of them.

Besides the lectures, we'll have a booth set up where we'll be online to The Color SIG most of the day, so if you're a CompuServe user, or just interested in learning more about CIS, be sure and drop by.

Coming Up

In the April issue, if all goes well, we'll look at interfacing your CoCo to an amateur radio (ham) station, to transmit color slow-scan television signals, as well as more news in the world of modeming.

Remember, you can contact me one of four ways:

Wayne Day
P.O. Box 79074-0074
Fort Worth, TX 76179

CompuServe: 76703,376
MCI Mail: 201-7723

or through the editorial offices of THE RAINBOW. Please remember to enclose a SASE if you desire a quick response.

Color Computer / FLEX / OS-9 BBS LIST Addendum
updated 12/1/84

A/C	Number	City	BBS Name	Remarks
(203)	334-5778	Bridgeport, CT	Mission Control	
(209)	674-5391	Madeira, CA	Personalized Programming	
(209)	835-6496	Tracy, CA	Silicon Rainbow Prod	
(212)	423-4623	Woodhaven, NY	Saturn Electronics	
(215)	866-1805	Bethleham, PA	Colorama	
(217)	359-9577	Urbana, IL	CCSH BBS #1	HQ SYS
(303)	297-9127	Denver, CO	Trash Heap TBBS	
(305)	XXX-6809	Hialeah, FL	Coco Corner	DELETED
(312)	278-9513	Chicago, IL	Howard Med Sys	
(408)	629-2277	San Jose, CA	Microbur BBS	
(408)	646-1850	Monterey, CA	Pen-Co BBS	Note 10
(416)	652-3480	Toronto, ON	True North Database	Note 9
(513)	396-7467	Cincinatti, OH	CINSOFT	
(514)	658-3087	Chambly, Que	Color-80 #7	Note 9
(602)	899-1350	Chandler, AZ	Coco Pub	JDOS
(602)	996-8828	Scottsdale, AZ	Motorola Coco Bugs	
(609)	399-7108	Ocean City NJ	Colorama	
(617)	872-5170	Framingham, MA	Framingham Connection	
(701)	839-0390	Minot, ND	Country Micro BBS	Correct City
(716)	473-2334	Rochester, NY	Colorama	
(803)	791-7389	Columbia, SC	Midlands-80 Comp Club	
(804)	868-0922	Tidewater area, VA	Peninsula Color Board	
(813)	345-8100	(unknown), FL	CocoNet	
(914)	738-6857	Pelham, NY	M&M's Public BBS	
(914)	961-8049	Westchester, NY	Westchester BBS #2	

NOTES: 9 — Evenings and Weekends (generally after 1700 on weekdays)
10 — 1800-2000 Mon-Fri / 2200-0700 Sat / 1400-1600 Sun

DATA COMMUNICATIONS

Download the lowdown with WEFAX

Weather . . .

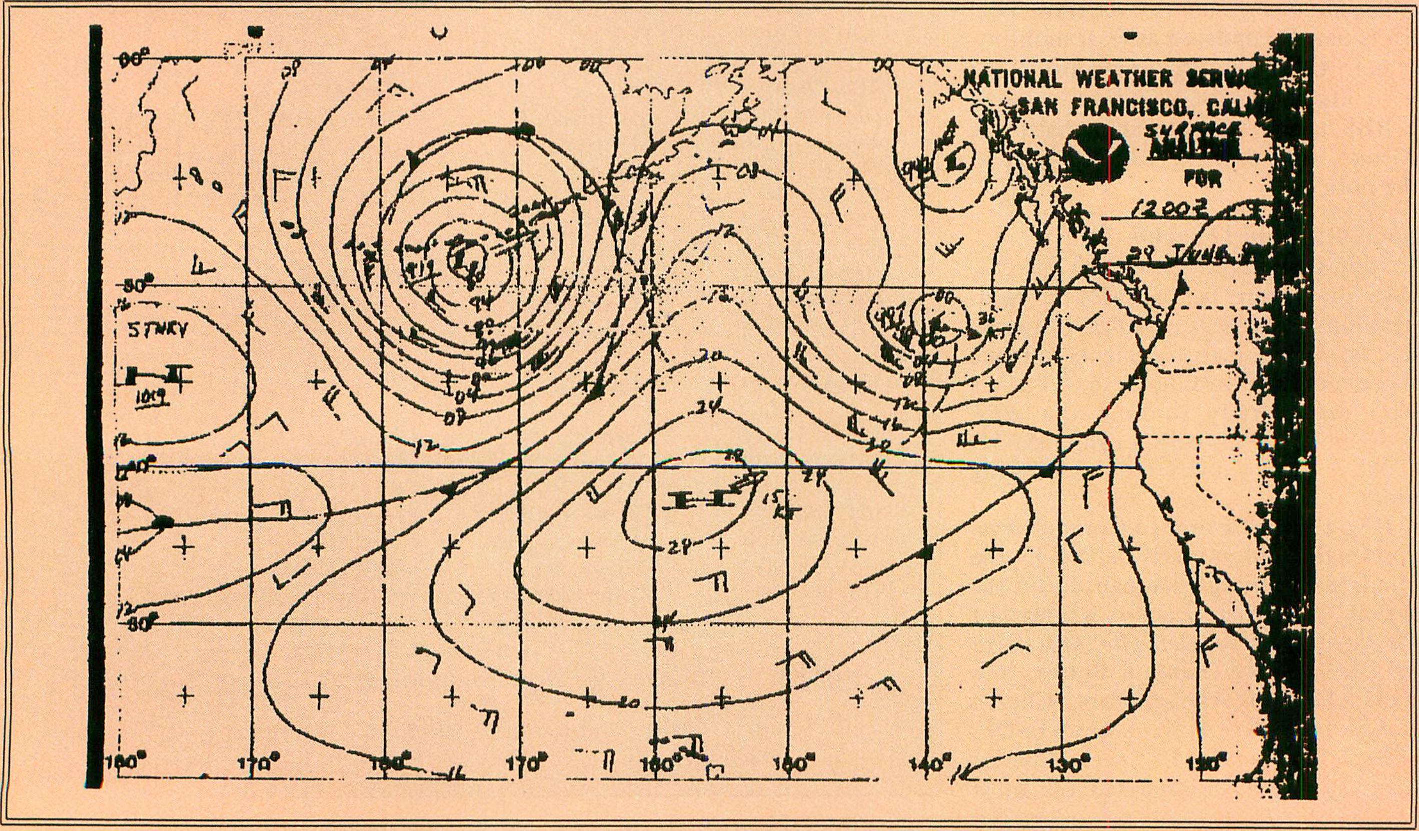
Hovering roughly 22,300 miles above the equator is a remarkable device. Since 1974, this Geostationary Operational Environmental Satellite (GOES) and its predecessors have been sending pictures of the earth, taken in visible and in infrared light, down to earth stations via a microwave link. Every day, a dozen or more images of the cloud cover over our part of the planet are processed by a government ground station, the images enhanced, and state and national boundaries added. These enhanced images are then "uploaded" back to the satellite by microwave. The satellite retransmits the enhanced images to a number of other earth stations around the country.

(Marty Goodman has, among many other things, been involved with various Color Computer software and hardware projects.)

One such secondary station is near me in Redwood City, Calif. There, meteorologists examine these precious photographs, and are able to draw two synoptic charts per day of weather fronts and such. (A "synoptic chart" is that map with all the wavy lines indicating areas of equal temperature, warm and cold fronts, and sometimes wind and sea information as well.)

The enhanced satellite photos and the hand-drawn synoptic charts are sent in facsimile (fax) format (a 40-year-old electronic protocol for picture transmission used by wire services as well) over a telephone line to a transmitter. In my case, that transmitter is located at Point Reyes, Calif. This fax signal is then rebroadcast, primarily for ships at sea, on a number of high frequency shortwave bands.

Twice a day in my area, a series of visible and infrared photos of my part of the world taken from space, along



Or Not?

By Martin H. Goodman, M.D.

with superb meteorological charts, are sent out over shortwave frequencies. Until recently, it took, in addition to a shortwave receiver, $5,000 worth of mechanical facsimile machines to turn that warbling fax signal back into a picture.

About The Authors

As you might well imagine, my good friends, the authors of *Graphicom,* have an abiding interest in graphics data. They decided to use the processing capabilities of the CoCo and its amazing built-in analog signal processing capabilities to turn a fax signal back into a picture and turn that picture into hard copy.

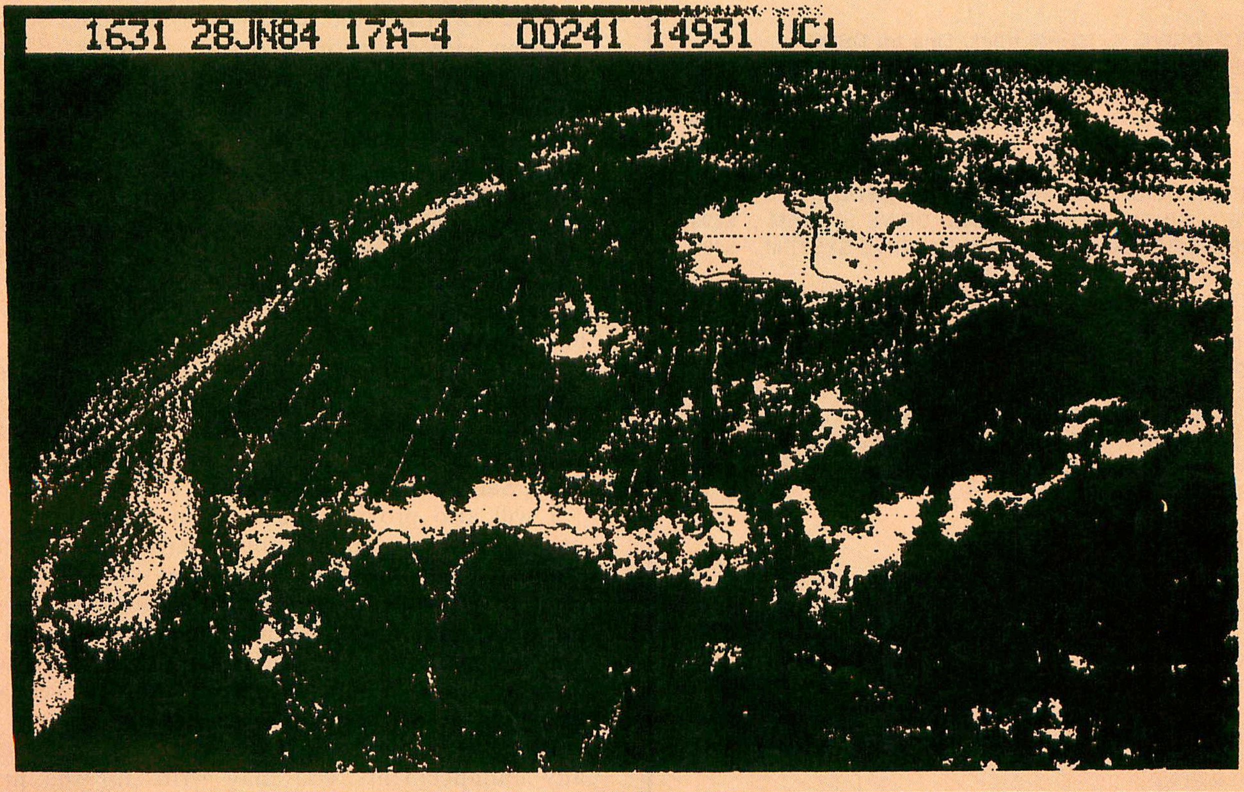
When they were done, they had a tiny assembly language program (only about 2K long) that uses the zero crossing detector of the cassette port of the CoCo to receive a fax signal from any BFO-equipped shortwave receiver and process it, turning that signal into a 54K-byte picture inside the CoCo.

Now, a 54K image is exactly nine times more information than the CoCo can display on the screen at one time, so the program they wrote, *WEFAX,* has built-in routines to allow the user to pan the CoCo Hi-Res screen over that larger "virtual" image.

They also supplied routines for saving the pictures to *Graphicom* format picture disks (two pictures to a disk, 54K is a lot of data!), and for transferring those pictures from the computer's memory to paper using an Epson dot-matrix printer. It will not surprise users of *Graphicom* to learn that all program control is via a joystick and one fire button.

Technical Details

Due to the 64K RAM memory limitation of the CoCo,



my friends were only able to process roughly one-half of the vertical and horizontal data contained in the fax transmission. Even so, the images produced are of remarkable quality. (See the sample pictures included with this article.) Indeed, when they took the pictures down to the Weather Service office in Redwood City, it turned out the CoCo *WEFAX* hard copy was equal, if not superior, in quality to the hard copy produced by some of the $5,000 mechanical fax machines there.

Rather than totally throw away every other line of received fax data, the *WEFAX* program does a remarkable thing. During reception of the picture, it uses every other line to construct on the CoCo Hi-Res screen a 6K compressed, representative image of what it's receiving. When reception is complete, you are then switched to the 54K image and your pan function.

As you will see in the official *WEFAX* documentation that follows, a minimal amount of hardware is needed to interface a shortwave receiver to the CoCo cassette port. This simple circuit, consisting of two LEDs (used as zener voltage limiting diodes), a single resistor, and a single capacitor, is used solely as a voltage limiter and DC filter. All other processing of the signal is done by the CoCo's internal hardware and the magic of the *WEFAX* software.

Required Hardware

A 64K, one disk drive equipped Color Computer (any model) and one joystick are required. An Epson dot-matrix printer is needed to produce hard copy. Almost any general communications shortwave receiver with a BFO (and preferably LSB and USB selection capability) will do to receive the pictures. Your receiver does need a minimum of frequency stability in order to receive a clear *WEFAX* picture, but most receivers costing more than $150 will suffice.

What Frequencies To Try

There are hundreds of stations all over the world broadcasting weather map data. *WEFAX* was written explicitly for weather map reception, and while it does receive other fax data (like UPI wirephoto information), images produced are likely to be somewhat blurry and/or distorted. To get you started, here are some of the more useful frequencies to listen to to find *WEFAX* data. All frequencies are in kilohertz.

East Coast, Station NAM in Norfolk, VA. 3357 kHz, 4975 kHz, 8080 kHz, 10865 kHz, 16410 kHz, 20015 kHz

West Coast, Station NMC in Point Reyes, Calif. 4346 kHz, 8682 kHz, 12730 kHz, 17151 kHz

West Coast, Station WWD in La Jolla, Calif. 8646 kHz, 17411 kHz

The Program And Its Source Code

The documentation follows the BASIC listing. Carefully type this program in *exactly* as it appears. Be sure *not* to alter even the line numbers. The program has a built-in checker for errors, which, when you run it, will tell you if you made an error typing in the data statements, and the line number where the first error appeared. Those of you receiving RAINBOW ON TAPE will, of course, be spared this agony. When you have the program typed in correctly, typing *RUN* will make it work.

For those who do not receive RAINBOW ON TAPE, the program *WEFAX/BAS* is available for downloading from CompuServe's Color Computer Special Interest Group (SIG) in database XA2. In addition, also posted in XA2 is *WEFAX.ASM,* the full assembly language source code (written with a version of the Micro Works SDS Macro 80C). This will be of interest and value to those who wish to insert their own printer routines for different printers. These people should carefully study the existing routine. It prints successive rows of dots in overlapping fashion. To produce a reasonable picture, the printer you support must be capable of doing this, too. For those without this editor-assembler system, note the printer routine is a separate module at the end of the program, allowing you to easily substitute your own routine even if you don't have the source code.

For those who cannot download the source code from CompuServe, I will provide you with a copy if you send me a disk, a mailer, return postage and $10 for handling. Address requests to Marty Goodman, 1633 Bayo Vista Ave., San Pablo, CA 94806.

I will also provide you with an experimental version of the program that not only receives, but is capable of sending a fax image as well. However, I must make it clear that I will *not* support either program, or answer *any* questions about it, because I'm not the original author, and neither I nor the authors have time to do so. Your comments are, of course, welcome, but it is very unlikely we will be able to respond to questions.

Both the authors and I would be delighted to receive any enhancements you may write for the program,

TEAC
PANASONIC
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HALF HEIGHT

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DIRECT DRIVE, ½ HT. 40 track, 5ms t/t, DSDD
DRIVE 0, SINGLE DOUBLE SIDED DRIVE SYSTEM . $399.
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All drives include case and power supply, J&M controller, all cables and Disk BASIC Manual. All connections are gold plated. Dual drives come assembled in dual case with dual supply and rear gold plated date connector.

J&M controller with JDOS and manual .... $129.
J&M controller with RSDOS and manual. .... $129.
J&M controller without DOS ROM chip .... $109.
JDOS ROM with manual .... $ 30.

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Holds 70 diskettes, key lock, 7 dividers, tinted acrylic case .... **$15.**
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especially alternative printer routines. I'd like to see a routine for the C. Itoh Prowriter printer. I haven't had time to write one yet for myself. If you send us such a routine, you'll be on our "list" for receiving other goodies.

The Documentation

I'll let the authors themselves provide you with further instruction on using their *WEFAX* program. Following this listing is material mainly consisting of *Graphicom* screens the authors meticulously and laboriously drew, just in order to better share this program with you.

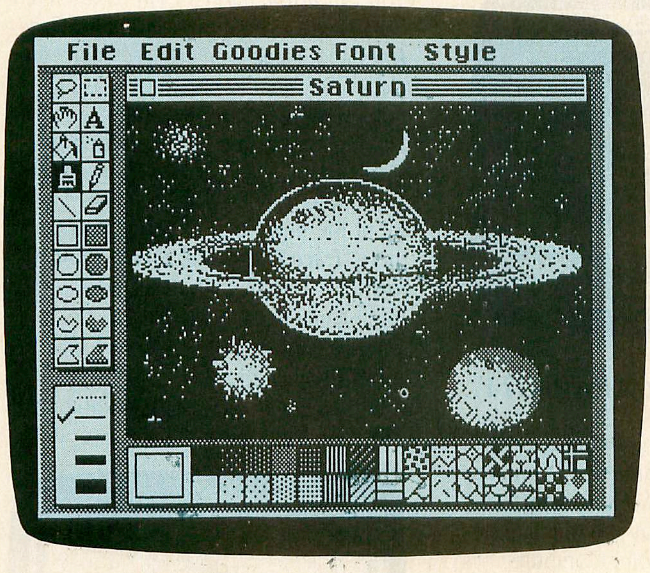
190	217
430	111
904	161
916	84
926	82
938	57
END	179

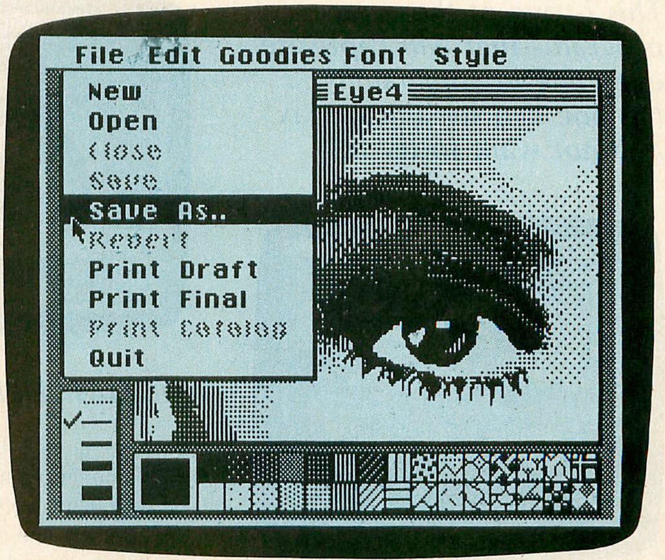
The listing:

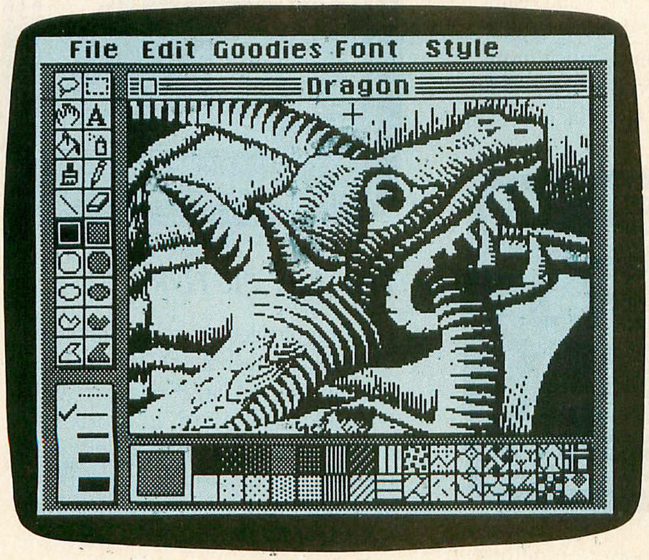
```
10 REM THIS PROGRAM IS PUBLIC DO
MAIN
20 PCLEAR4
30 F1=651:REM 60 LPM ADJUST
40 F2=901:REM 90 LPM ADJUST
50 F3=1027:REM 120 LPM ADJUST
55 POKE150,1:REM PRINT=9600 BAUD
60 CLS
70 PRINT"   WEATHER FACSIMILE RE
CEIVER"
80 PRINTSTRING$(32,"-");
90 PRINT
100 PRINT"THIS PROGRAM WILL RECE
IVE FM FAX";
110 PRINT"AT 60, 90 & 120 LINES/
MINUTE."
120 PRINT"CONNECT THE CASSETTE E
AR (BLACK)";
130 PRINT"PLUG TO THE RADIO'S EA
R JACK OR"
140 PRINT"CONNECT IT ACROSS THE
SPEAKER."
150 PRINT"CHECK THAT THE RADIO I
S TUNED IN";
160 PRINT"AND THAT THE BFO IS TU
RNED ON."
170 PRINT"AFTER THE PROGRAM IS R
EADY YOU"
180 PRINT"CAN USE THE TUNING MET
ER TO"
190 PRINT"ADJUST THE RADIO."
200 PRINT
210 PRINT"PLEASE WAIT..."
220 AD=&H600:LI=900
230 READA$,CS
240 IF A$="X" THEN 320
250 FOR I=1 TO 64 STEP 2
260 A=VAL("&H"+MID$(A$,I,2))
270 POKE AD,A:CS=CS-A:AD=AD+1
280 NEXT
290 IF CS THEN PRINT"DATA ERROR
IN LINE";LI:END
300 PRINT@462,944-LI
310 LI=LI+1:GOTO 230
320 A=INT(F1/256):POKE&H600,A:PO
KE&H601,F1-256*A
330 A=INT(F2/256):POKE&H608,A:PO
KE&H609,F2-256*A
340 A=INT(F3/256):POKE&H610,A:PO
KE&H611,F3-256*A
360 PRINT"RECEIVE *60* *90* *120
* LPM"
370 PRINT
380 PRINT"     *PRINT TO EPSON PR
INTER*"
390 PRINT
400 PRINT"   *REVERSE VIDEO THE P
ICTURE*"
410 PRINT
420 A$=CHR$(PEEK(&HC000))+CHR$(P
EEK(&HC001))
430 IF A$<>"DK" THEN PRINT:PRINT
:PRINT:GOTO470
440 PRINT"DISK     *VIEW* #1 ***
#2 ***"
450 PRINT"PICTURE     *LOAD*  ***
    ***"
460 PRINT"STORAGE     *SAVE*  ***
    ***"
470 PRINT
480 PRINT"TUNING     I--------I"
490 PRINT"METER:     1500    2300"
500 PRINT
510 PRINT"JOYSTICK        RESTART
 SCAN"
520 PRINT"USE WHEN      PHASE HOL
D  PHASE"
530 PRINT"RECEIVING:    <--   SCA
N   -->";
540 EXEC CS
900 DATA0285050A004D00E703820704
0033009904000800002600720F718634
B7FF030F,1740
901 DATA660F671700E3260EB7FFDEBE
C0066F846F01AD9FC004B7FFDF7FFF40
7F098610,3846
902 DATACE03D78E0400A6848A40A780
8C060025F51703338D0220DE8D57080B
0002840D,2661
903 DATA100002821216000281041B22
048F021C440332090E660011090E7700
1D090E88,1154
904 DATA001C8080000007 88D28139568
03D61A9C6803D580800000678602200 2
86039761,2490
```

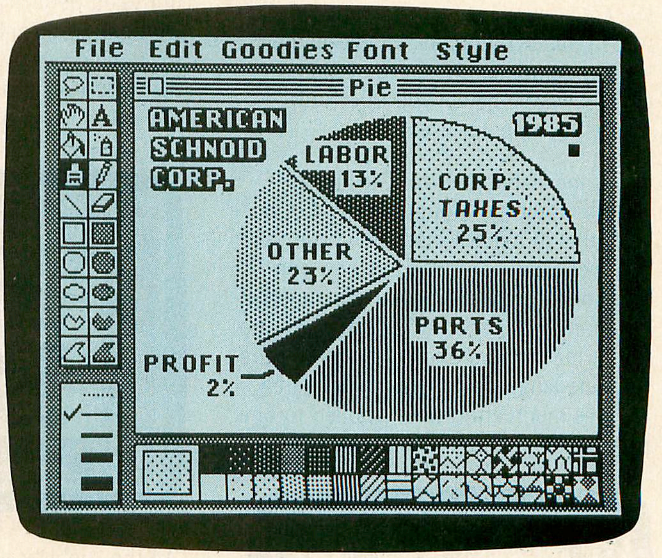
```
905 DATA8D0F131568034B1A1C68034A
808000004E17027235109F628D2ADD64
8D773410,2244
906 DATA1700908D1F1093642707351O
17008420E71700EE8D4D27EBAEE43003
EC84AD8B,3021
907 DATA3510206F8D18FC015A445454
8D1B2607C1082302C60839C10423FBC6
0439B7FF,2850
908 DATADEAD9FA00AB7FFDF39B7FFDE
BEC000B7FFDF8C444B39B6FF00840139
8DF827FC,4792
909 DATA9766398DF19166270B8E222E
301F26FC8DE49766399E628D6B916422
04D16424,3391
910 DATA073005E6842AF0398D619165
22F3D16525EF39CE04008D536D012A04
96651F89,3174
911 DATA3402E0E45CE7E4C6203D33CB
8D366D012A0496641F893406E6842A10
33C6E6C4,3524
912 DATAA68D001FA7C4E78D00192014
E6C6C840E7C64CA16123F533C820A6E4
6A6226EC,4040
913 DATA326339CFEC84841FC41F39A6
0244444444E602C40F39B6FF205A2705
B1FF2027,3274
914 DATAF839C6208DF02708C6408DEA
27028DE654D16727158E05409667D767
E686CA40,3880
915 DATAE7869667E686C4BFE7863986
34B7FF03863CB7FF0186D6B7FF208680
B4FF0027,4605
916 DATA053DAC842008DC52DD56DC50
DD54862AB7FF208680B4FF0027043D12
200ACC26,3373
917 DATA02DD56CC0E00DD548634B7FF
019E4086D6B7FF208680B4FF0027038E
0001862A,3555
918 DATAB7FF208680B4FF0026029E42
301F26FCA69439DF483A3386DF4C8601
A7844F5F,3616
919 DATADD4AB6FF205CC1262504A101
2005B1FF2027F2D74E1DA18BD34ADD4A
9348251B,3557
920 DATADD4AD64EF7FF02D14F698424
0430012005CC0001E70112C606200F86
01B4FF00,3018
921 DATA260617FE7716FD8EC6049C4C
25B4DC48934A2F07A18B83000126F917
FF2D399E,3332
922 DATA52DE4486602083C5F9E50DE46
862020838DF55F8DEA8DF0C6608DE48D
EAC6C020,4425
923 DATADE5F2006C6082002C610308D
FD123ACE004086080E680E7C04A26F98D
49861197,3397
924 DATA4F8E26029F52CE0E00DF5033
C820DF5430890120 9F568DB8DE54DF50
9E569F52,3497
925 DATA8CFE0225E6397FFF22CEFFC6
A75AA75CA75E860444C607442406334 1
A7C02002,3602
926 DATAA7C15A26F23986F0B7FF22CE
FFC6A75AA75DA75F860E20DC8690F601
5BC13F26,4381
927 DATA015C3D584958498E2602308B
B6015A813F26014C3086203800000000
00000000,1695
928 DATA000000000000008DBD8DCDFC
015A340617FD6BFC015A10A3E127028D
BB17FD83,2983
929 DATA27E9398DA18E260263808CFE
0225F939108E0E00C620A680A7A05A26
F9308840,3427
930 DATA108C260025EE39108E0E00C6
20A6A0A7805A26F9308840108C260025
EE392602,2740
931 DATA262226426E026E226E42B602
B622B642C6002002C611D760D661C103
26028D24,2738
932 DATA17FF43318CD88609AEA13422
966181032606 8D9C8D7620048D728DAB
0C603522,3091
933 DATA4A26E539B7FFDEFEC006CC02
00EDC4CC1102ED428E0E00AF44AD9FC0
04B7FFDF,4263
934 DATAD660260FC600A6854C1026FB
E95CC11723F439C62BA6854C1026FBDA
5CC14323,3644
935 DATAF439C6ED2002C6F7340417FE
D9D665C00686033DDB64EBE0D7608602
97618D0C,4102
936 DATA7FFF407F098617FC8D26FB39
3476B7FFDEBEC006D661E7846F01CC0E
00ED04CE,4147
937 DATAFFFF9660C6183D1083013325
03C30002334183001224F9C30013E703
1F30E702,2785
938 DATA108E0018AD9FC0048D1F6C04
EC0210831101 2602CB025CC1122303C6
014CED02,2497
939 DATA313F26E0B7FFDF35F617FC2A
260C7FFF407F098617FC2516FB3C3917
FE48B6FF,3905
940 DATA22840126388 6FE976F8E2602
861B8D2386338D1F86178D1B8D24861B
8D158633,2797
941 DATA8D1186018D0D8D1630890540
8CFE0225DB860DB7FFDEAD9FA002B7FF
DF398DA9,3845
942 DATA860D8DEF861B8DEB864C8DE7
86008DE386038DDF86603412860197 5F
A684108E,3786
943 DATA0058C6084969A05A26FA3089
00C024EC8E0058C608A680438DB95A26
```

CoCo Max


File Edit Goodies Font Style
Saturn


File Edit Goodies Font Style
Eye4
New
Open
Close
Save
Save As..
Revert
Print Draft
Print Final
Print Catalog
Quit


File Edit Goodies Font Style
Dragon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AMERICAN SCHNOID CORP.
1985
LABOR 13%
CORP. TAXES 25%
OTHER 23%
PARTS 36%
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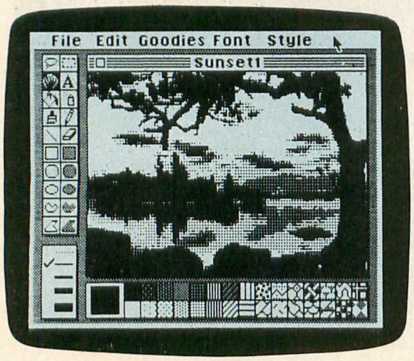
Take your CoCo to the MAX.

COLORWARE

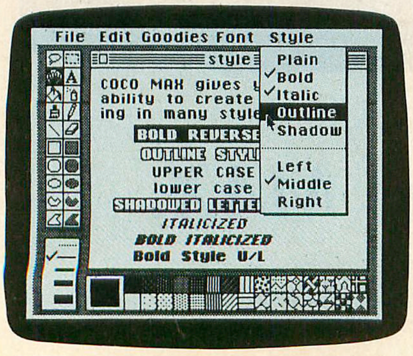
CoCo Max

This is one of those rare programs that will captivate everyone in your family.... No one can see CoCo Max and not want to try it!


File Edit Goodies Font Style
Sunset1

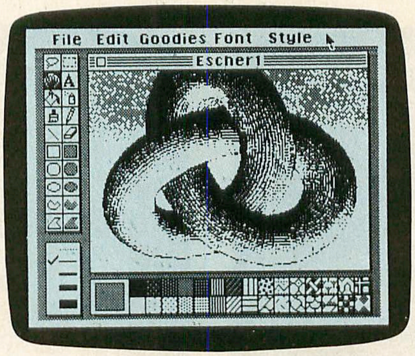
We are all witnessing an exciting revolution in microcomputers: a radically new kind of computer and software that opens a whole new world of creative power to computer users.

It was inevitable that this exciting approach would be brought to the CoCo. With this in mind, Colorware chose to go all out and maximize this new concept for the color computer. That meant designing not just software but hardware too. It meant thousands of hours of pure machine language programming. Rarely has this much effort been applied to one product for the Color Computer.


File Edit Goodies Font Style
style
Plain
✓Bold
✓Italic
Outline
Shadow
Left
✓Middle
Right

COCO MAX gives y
ability to create
ing in many style

BOLD REVERSE
OUTLINE STYL
UPPER CASE
lower case
SHADOWED LETTE
ITALICIZED
BOLD ITALICIZED
Bold Style U/L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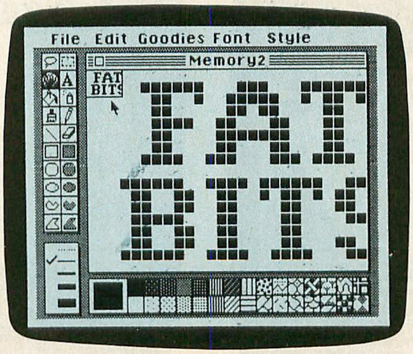
Escher1

UNMATCHED CAPABILITY...

Because we took the maximum approach: highly optimized machine code combined with hardware, CoCo Max truly stands above the rest as the ultimate creative tool for the Color Computer. It's unrivaled performance lets you create with more brilliance and more speed than any similar system – much more than you ever imagined possible. And, you can do it in black & white or color.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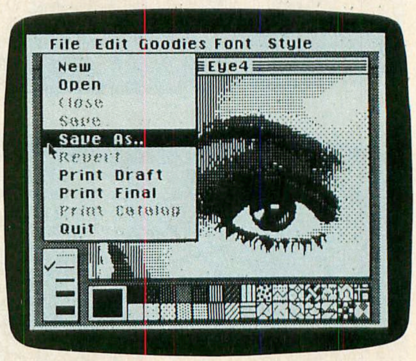
Memory2
FAT BITS
FAT
BITS

All the sophisticated power of the bigger systems is there: *Icons, Pull-Down Menus,* full *Graphic Editing, Font Styles,* and all kinds of handy tools and shortcuts.

Plug your joystick, mouse or touch pad into CoCo Max's Hi-Res Input Unit. Then use a delightfully simple *Point-and-Click* method to get any of CoCo Max's powerful graphic tools. It has them all:

You can *Brush, Spray* or *Fill* with any *Color, Shading* or *Pattern.* Use *Rubber Band Lines* and *Shapes* (square, rectangle, circle, elipse, etc.) to create perfect illustrations with speed and ease. There's a *Pencil,* an *Eraser* and even a selection of *Caligraphy Brushes.* And, as you can see, CoCo Max can do a lot with text.
All of the newest special effects are there: *Trace Edges, Flip, Invert, Brush Mirrors,* etc. And all of the very latest super-capabilities like: *Undo,* which automatically reverses your mistakes, and *Fat Bits* which zooms you way in on any part of your subject to allow dot-for-dot precision.


File Edit Goodies Font Style
Eye4
New
Open
Close
Save
Save As..
Revert
Print Draft
Print Final
Print Catalog
Quit

THE BIG PICTURE

The large image box in the middle of the CoCo Max screen is actually only a window on an even larger image. Use the Point-and Click "Hand" to effortlessly move your window over any portion of the larger image. You have a working area of up to 3-½ times the area of the window itself.

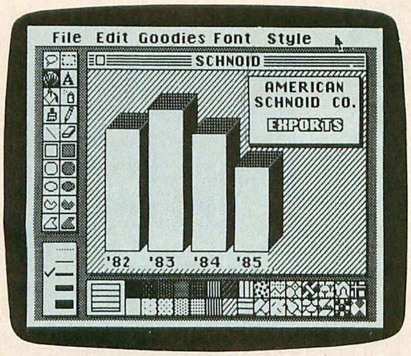
FLEXIBLE PRINTING...

CoCo Max gives you many ways to print. Fill a whole page with your image or condense two full CoCo screens to less than ¼ page for a finely detailed copy. "Dump" your CoCo Max screen full size or shrink it to ⅛ page size.

THE COCO MAX SYSTEM

FREEDOM TO CREATE...

Anyone who wants to create anything at all on their CoCo screen or printer will certainly be very glad to meet CoCo Max. CoCo Max's friendly yet sophisticated graphic and text capabilities let you almost instantly produce illustrations, diagrams, charts,



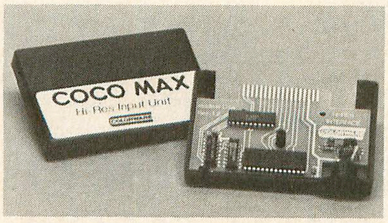
graphs, and computer art – for serious use or just for creative fun.

AN ABSOLUTE GUARANTEE

CoCo Max is a hardware/software system that no software-only system can match. Get CoCo Max and see your CoCo perform as it never could before. If you don't agree that CoCo Max is the ultimate creative tool for the Color Computer, simply return it within 20 days for a full, courteous refund from Colorware.

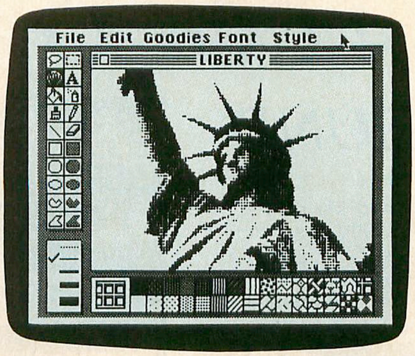
THE HARDWARE...

This is the key to CoCo Max's unmatched performance. Did you know the normal joystick input built into the Color Computer only allows access to 4,096 (64 x 64) points on the CoCo screen? Yet, the Color Computer's high resolution screen



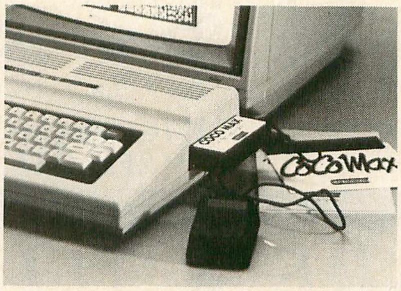
has 49,152 (256 x 192) pixels. This means that a joystick, mouse or even a touch pad can, at best, only access about one tenth of the pixels on the CoCo screen.

Most graphic programs ignore this hardware limitation of the Color Computer and give you only low-res control. Others attempt to overcome the limita-



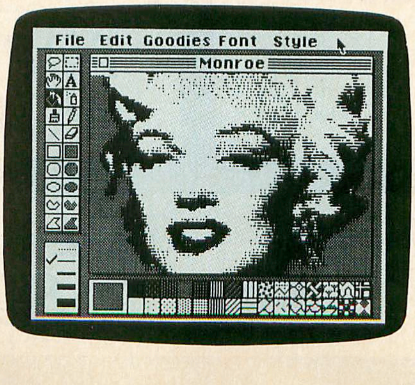
tion by using software schemes such as sliding windows. Although clever, these schemes yield sluggish and awkward results. Only CoCo Max does it the right way. The CoCo Max Hi-Res Input Unit plugs into your ROM slot and adds an entirely new joystick input to your computer – a precision one with a 49,152 point resolution to match the CoCo screen exactly.

Plug your same joystick, mouse or touch pad into this new input and you have a whole new kind of control. The difference is remarkable.

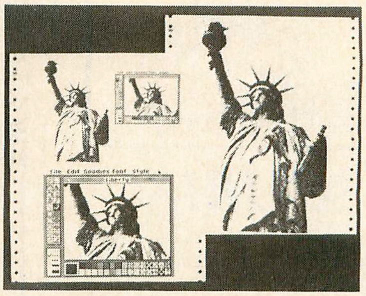


A DIGITIZER OPTION...

We studied all the video digitizers available and picked the best of them to link with CoCo Max. The DS-69 from Micro Works was our choice. This optional device lets you capture the image from any video source (video recorder, camera, etc.) on your Color Computer.



You may then use CoCo Max's graphic magic on it. The DS-69 is available as an option from Colorware from $149.95 complete with its own software on disk or tape. Using the DS-69 with a disk requires an RS multi-pak adaptor.



COCO MAX REQUIREMENTS

The CoCo Max System includes the Hi-Res Input Unit, software on disk or cassette (please specify) and user manual. It will work on any 64K Extended or non-extended Color Computer. You'll need a Radio Shack or equivalent joystick, mouse or touch pad. Disk systems require a Multi-Slot Interface or Y-Branching Cable.

THE COMPLETE COCO MAX SYSTEM,
with software on *DISK*........... ***$69.95***

with software on *CASSETTE* (Available Mar '85)......................... ***$69.95***

Y-BRANCHING CABLE-If you have a disk system but do not have a Multi-Slot Interface, use this economical 40-pin, 1 male, 2 female cable to connect the CoCo Max Hi-Res input unit and your disk controller to your CoCo..... ***$27.95***

COLORWARE

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(800) 221-0916

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Woodhaven, NY 11421
(718) 647-2864

VISA

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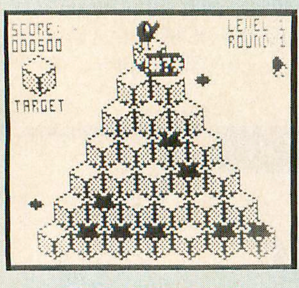
N.Y. RESIDENTS MUST ADD SALES TAX.

THE TOP 4 COCO GAMES...

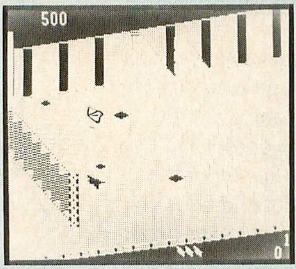


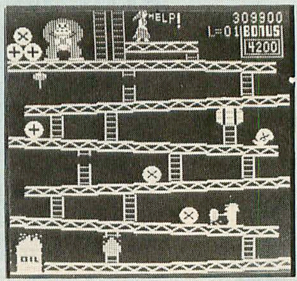
CUBIX

By Spectral Associates. Very much like the arcade smash! Jump little Cubix around the 3D maze trying to change the color of all the squares. With Death Globes, Discs, Snakes, etc. 32K Tape: $24.95

ZAKSUND

From Elite Software comes this fantastic arcade style space action game with 3 different stages of moving 3-D graphics. You've never seen anything like this on your CoCo! Great sound too! 32K Tape: $24.95



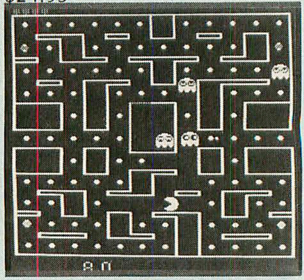


THE KING

Previously called 'Donkey King', you simply cannot buy a more impressive game for your CoCo. With 4 different screens and loads of fun! From Tom Mix Software. 32K Tape: $25.95

GHOST GOBBLER

From Spectral Assoc. This "PAC" theme game has been improved several times. It is definitely the best of its type. Brilliant color, action and sound, just like an arcade. 16K Tape: $24.95



COLORCADE

SUPER JOYSTICK MODULE

WITH RAPID FIRE!

ONLY $19.95

JOYSTICK INTERFACE/RAPID FIRE/6 FT. EXTENDER ALL IN ONE! The Colorcade allows connection of any Atari type joystick to your CoCo (including the Wico Red Ball). These switch type sticks are extremely rugged and have a faster and more positive response. They will improve the play of almost any action game.

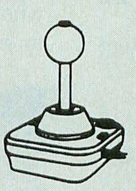
An adjustable speed rapid fire circuit is built in. Press your fire button and get a great burst of fire instead of just a single shot! You get a real advantage in shooting games that do not have repeat fire.

ATARI JOYSTICK

ONLY $8.50

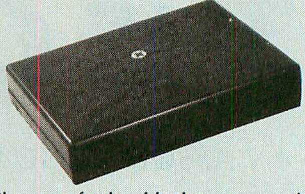
THE BEST YOU CAN BUY
WICO #15-9730

~~$34.95~~
$29.95



WICO FAMOUS "RED BALL"

ROM/ PROJECT/ PRODUCT CASE

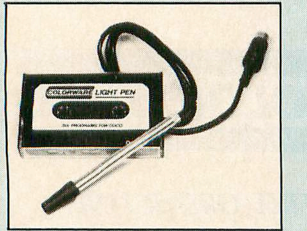


Give a professional look to your project or product! High quality 3 piece injection molded plastic with spring loaded door. Designed especially for the CoCo ROM slot.

2 - 4 pcs.	$5.50 Ea.
5 - 9 pcs.	$3.50 Ea.
10 - 99 pcs.	$2.75 Ea.
100 & UP	Call Us.

P.C. board for 27XX EPROMS. . . $4.00 Ea.

COLORWARE LIGHT PEN

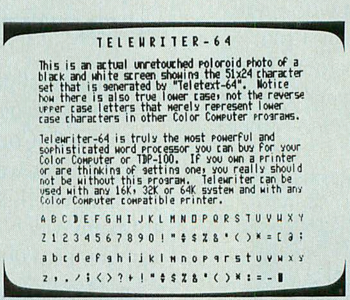


ONLY $24.95

WITH SIX FREE PROGRAMS ON CASSETTE!

The Colorware Light Pen plugs directly into your joystick port and comes with six fun & useful programs on cassette. Easy instructions show how to use it with Basic and it's compatible with light pen software such as Computer Island's "Fun Pack." Order yours today. Only $24.95 complete.

TELEWRITER-64



```
TELEWRITER-64

This is an actual unretouched poloroid photo of a
black and white screen showing the 51x24 character
set that is generated by "Teletext-64". Notice
how there is also true lower case, not the reverse
upper case letters that merely represent lower
case characters in other Color Computer programs.

Telewriter-64 is truly the most powerful and
sophisticated word processor you can buy for your
Color Computer or TDP-100. If you own a printer
or are thinking of getting one, you really should
not be without this program. Telewriter can be
used with any 16K, 32K or 64K system and with any
Color Computer compatible printer.

A B C D E F G H I J K L M N O P Q R S T U V W X Y
Z 1 2 3 4 5 6 7 8 9 0 ! " # $ % & ' ( ) * = [ @ ;
a b c d e f g h i j k l m n o p q r s t u v w x y
z , . / ; < > ? + ! " # $ % & ' ( ) * : = - █
```

DISK $59.95
CASSETTE. . . $49.95

Colorware researched the word processors available for the Color Computer. This is the best. Telewriter-64 is a truly sophisticated system that is marvelously easy to use. It works with any 16K, 32K or 64K system and any CoCo compatible printer.

TOP-RATED COCO WORD PROCESSOR

COLORWARE

VISA MasterCard

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Why do more CoCo owners choose 'REAL TALKER'?

Sure it's priced right, but there's more...

Thousands of 'Real Talker' owners know 'Real Talker' beats ALL other Coco voice synthesizers in ease of use and flexibility. And, NO other Coco talker has a clearer, more intelligible voice. That's quite a lot of advantage when you consider Real Talker's unbeatable price. Yet, Real Talker has some important features that you simply will not find in other Coco talkers:

'Real Talker' is compatible with any 16K, 32K, 64K Extended or non-extended Color Computer. It works with any cassette or disk system and comes complete and ready to talk through your T.V. or monitor speaker. Price includes the 'Real Talker' electronic voice synthesizer in a ROM pack, software on cassette (may be transferred to disk), and user manual.

'SAY' command - You'll have your computer talking brilliantly in just minutes thanks to this powerful new command. Type SAY "ANYTHING YOU WANT" and your words are instantly spoken. It's that simple. Think how easy this makes creating speaking Basic programs. Adding speech to your existing programs is a snap too.

'CONVERT' - This is a truly powerful command for the basic programer. CONVERT automatically transforms a machine language dependent speaking program into a stand-alone Basic program. In other words, you can effortlessly write speaking Basic programs that do not require a machine language translator in memory. This is a unique feature of 'Real Talker'. No other voice synthesizer gives you anything even remotely approaching this type of capability - even synthesizers costing considerably more.

COLORWARE
'REAL TALKER'
INSTRUCTION
'REAL TALK
HARDWARE VOI
SYNTHESIZER
COLORWARE

'Real Talker' is a full-featured electronic voice synthesizer unit built into a compact cartridge case. You simply plug it into the side of your computer.

NOW INCLUDED WITH 'REAL TALKER'........

1. ***'DR. TALK***-This interactive "Eliza" type psychoanalyst program will discuss your innermost problems at length.

2. ***'TALKING BATTLESHIP'***-It's you vs. the computer in this speaking version of the classic game.

3. ***'TALKING BLACKJACK'***- Play for big stakes against a rather talkative casino dealer.

ONLY

$59⁹⁵

Other features include software controlled pitch, unlimited vocabulary text-to-speech, and even a program that will recite any ASCII file (such as from Telewriter-64 & other word processors). You also get Colorware's unique full-screen phoneme editor program that let's you experiment with and modify speech at it's most fundimental level.

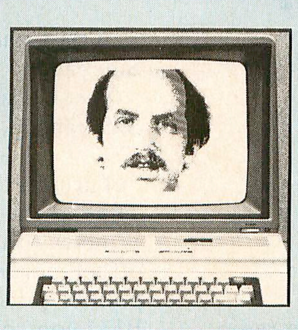
'REAL TALKER-1' (for the original Color Computer)..............***$59.95***

'REAL TALKER-2' (for the Color Computer-2)........................***$64.95***

'Y - BRANCHING CABLE' For disk systems. If you have a disk system but do not have a Radio Shack Multi-Slot unit, this economical cable will allow to connect and use your Real Talker and Disk system together..................................***27.95***

TALKHEAD

If you have a 'Real Talker', do not deprive yourself of this absolutely incredible machine-language Talking Head simulation program. While other talking head simulations use a minimal cartoon-like face, TALKHEAD uses high resolution, full-screen, digitized images of an actual person's face to create a life-like animated effect.



ACTUAL UNRETOUCHED PHOTO

SOFTWARE FOR THE 'REAL TALKER'

TALKHEAD can be easily commanded in Basic to appear on screen and say anything you want. Available on cassette or disk for only $19.95, TALKHEAD requires 64K and a Colorware 'Real Talker'.

ONLY $19.95

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N.Y. RESIDENTS MUST ADD SALES TAX.

```
F8351230,3277
944 DATA014A26D23900000000000000
00000000000000000000000000000000
00000000,380
945 DATAX,1560
```

WEFAX Official Documentation

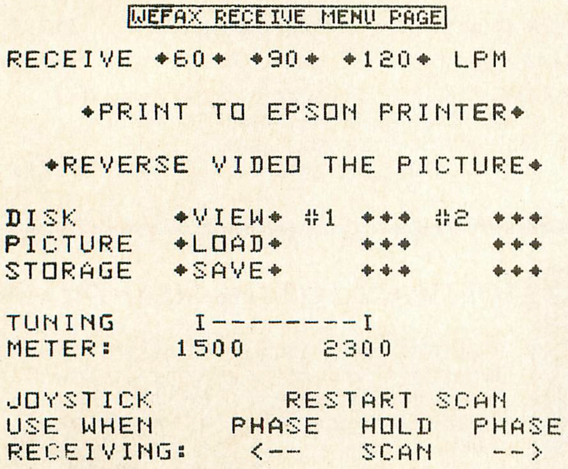
Have you ever wondered what the weather is doing far out at sea, but lacked the expensive equipment necessary to receive the charts?

Here is a low cost way you can. Just get a Radio Shack 64K Extended BASIC Color Computer, joystick and cassette recorder with cable.

The one other thing you need is a good shortwave receiver that can receive single sideband (SSB) transmissions. SSB is used because it's much more efficient than the regular AM and FM modes used by local broadcasters, but it does require a receiver that has a beat frequency oscillator (BFO) to make any sense of the signal. Many of the newer digital-readout portable shortwave radios (and some cheaper sets) have this, but you probably won't find it on a typical multiband radio or a "jam box." If your set has this capability, there will be a switch to turn the BFO on or off (on better receivers this will have separate CW and SSB positions). Follow the instructions you got with the radio for tuning in SSB transmissions.

WEFAX is written in machine code to get the required operating speed. The machine code for *WEFAX* is loaded into memory by a BASIC program. The data that makes up the second half of the listing is the actual machine code, along with an error checking number for each line.

Type in the program exactly as it is printed. Be careful to get all the spaces in the text of the menu. When typing is complete, save it two times on tape (or disk) and then type *RUN*. If you get an error, then reload the program and correct the error. Now save it, then *RUN* it again. When it loads properly you should see the menu page appear.



```
            WEFAX RECEIVE MENU PAGE

RECEIVE ◆60◆ ◆90◆ ◆120◆ LPM

    ◆PRINT TO EPSON PRINTER◆

  ◆REVERSE VIDEO THE PICTURE◆

DISK      ◆VIEW◆ #1 ◆◆◆ #2 ◆◆◆
PICTURE   ◆LOAD◆    ◆◆◆    ◆◆◆
STORAGE   ◆SAVE◆    ◆◆◆    ◆◆◆

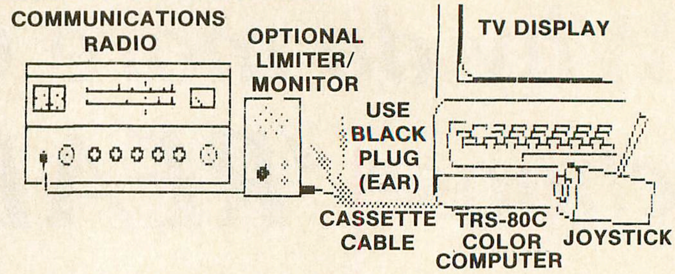
TUNING     I---------I
METER:    1500      2300

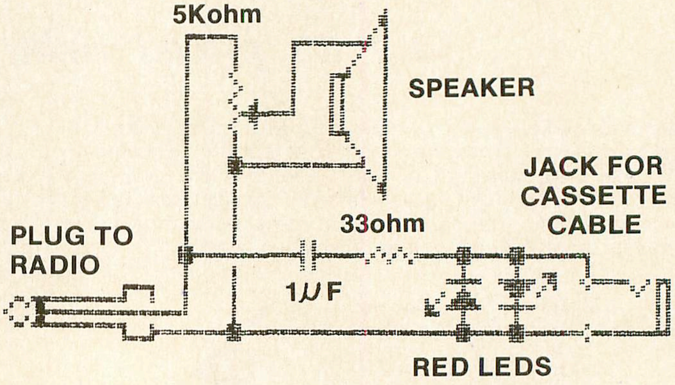
JOYSTICK          RESTART SCAN
USE WHEN      PHASE  HOLD  PHASE
RECEIVING:     <--   SCAN   -->
```

Setting Up The Radio

If you find that the computer interferes with the radio, try moving the two apart. Another thing you can try is coiling the cassette cable around a ferrite rod. It also helps to use shielded (coax) cable to an antenna 20 or more feet away.

SETTING UP THE RADIO





OPTIONAL LIMITER/MONITOR

The optional limiter/monitor shown here helps reception of signals with fading and noise. It also lets you monitor the signal at a comfortable (and adjustable) level while maintaining a good signal into the computer.

The Menu

The menu screen of *WEFAX* receive is in ways like the control panel of a mechanical facsimile receiver. Try moving the joystick around; you will see that various functions will be highlighted.

To select any function, move the joystick until the function you want is highlighted and tap the button to activate it. When that function is completed or if you don't select any function and tap the button you will pan over the picture (see PAN).

To abort any function, hold down the button until it stops (this may take a second or two for some of the functions like *PRINT*). Don't tap the button, just hold it down until the operation stops.

Tuning In A Fax Station

Here are two stations that broadcast continuously:

West Coast/Pacific: NPM (Hawaii) 14.823 MHz Lower Sideband

East Coast/Atlantic: NAM (Virginia) 8.027 MHz Upper Sideband

Turn on the radio's BFO (switch may say CW or SSB). Tune in the station and adjust for highest reading on the S meter (on some radios you may have to turn the BFO off temporarily to get a proper reading). Notice the jiggling pointer (black rectangle) on the tuning meter. Adjust the BFO control until the movement of the pointer is mostly contained between the 1500 and the 2300 Hz marks. Weather charts are mostly white so the pointer will spend more time on the 2300 Hz mark when tuned to the proper sideband.

```
Other signals:                      I▒------█I
                                    1500    2300

Phasing interval:mostly black.     I█------▒I

Satellite picture: varying.        I▒--█---▒I

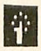
Effect of noise: random           ▒▒-▒---▒-▒I ▒

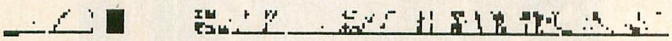
Signal + noise:                 ▒ I▒-▒----█▒   ▒
```

Receiving The Picture

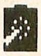
Now select 120 lines per minute (for most stations), and tap the button, move the joystick to center bottom and you are now receiving a picture.

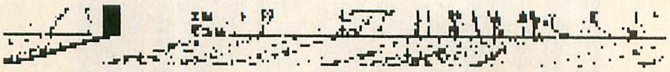
If you start when a chart is in progress, you may see the chart not properly centered.



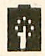


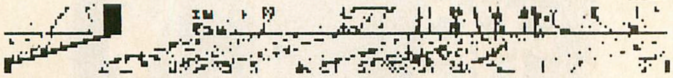
To center (phase) the incoming picture move the joystick in the direction that you want the picture to move.



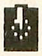


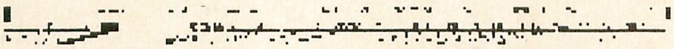
Return joystick to center bottom again and see if picture detail is in from side edges.



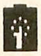


Move joystick to top center and wait a second for the scanning to start at the top again.



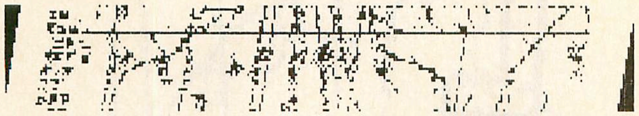


Then resume scanning by moving stick down.



Setting The Fine Speed Controls

Since fax requires a very accurate speed, the slight variation between different computers must be adjusted for. If the picture appears skewed on your computer, adjust the numbers in the BASIC loader. This is an example of the number being too large:



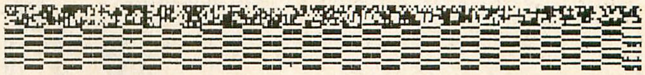
If you were using 120 speed, edit Line 50 and change the last one or two digits (for the example above try decreasing it by eight). Some experimentation will be needed to get it just right.

```
Type LIST 30-50.    ↓(Adjust these numbers)
                    30 F1=645 :REM 60 LPM ADJUST
Fine speed set      40 F2=898 :REM 90 LPM ADJUST
                    50 F3=1024 :REM 120 LPM ADJUST
```

Write the number down on paper and *RUN* the program. When you have it exactly right, you will probably want to *SAVE* the adjusted copy to avoid having to edit it each time. Note that each speed must be adjusted separately.

Pan Over Picture

Tapping the button when no function is highlighted shows you the picture in memory. Since the picture is much larger than can be displayed, the screen is made into a window which is used to pan over the Hi-Res picture. Move the joystick around to see the rest of the picture. Tapping the button again gets you back to the menu. (Note: if you do this before a picture is received or loaded, you will see a memory start up pattern.)



All the menu functions end with pan over picture. After any function you can tap the button to return to the menu.

Starting And Phasing

WEFAX Receive uses manual start, phasing and stop (abort). Many radios aren't frequency stable enough to make use of the World Meteorological Organization (WMO) remote control signals (300 Hz start, 25s 5% white phasing and 450 Hz stop). To start: select the speed appropriate for the station tuned in. When you hear a low tone followed by a "tweedling" sound, tap the button

* * * * [CCN] * * * *

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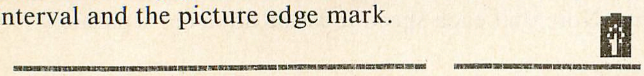
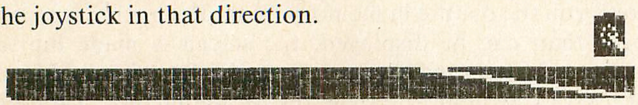
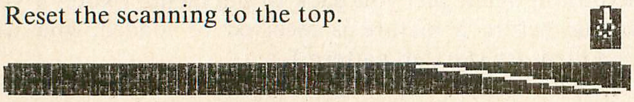
and move the joystick to center bottom. This is a phasing interval and the picture edge mark.



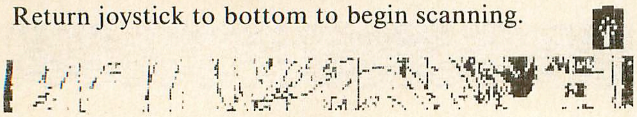
Phase the white break so that it is on the edge by moving the joystick in that direction.



Reset the scanning to the top.

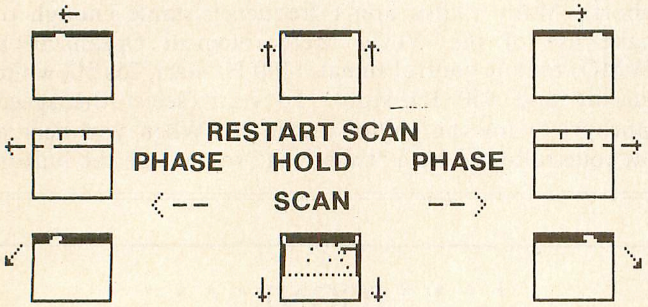


Return joystick to bottom to begin scanning.

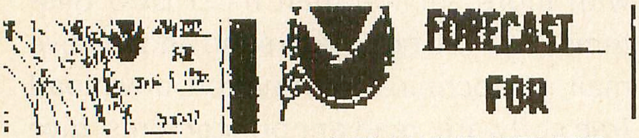


Receive Picture

The joystick is used to control the starting and centering of the picture during receive.



The picture you see during receive is only one-ninth the size and resolution. When completed you will see a portion of a much larger picture (see PAN).



DURING RECEIVE. LARGER PICTURE WHEN DONE.

Print Picture

The *WEFAX* print routine was designed to work with the Epson MX-80 printer with Graftrax. It is also usable on the Epson FX-80 and RX-80 printers. The Color Computer uses a serial port and thus the printer must have the buffered serial option or an external serial interface. For fastest printout of pictures, the program is set to 9600 Baud; set the printer accordingly. (You could also change the Baud rate in the program, but this would slow down the printout of pictures.) To use another type of printer would require changing the machine code portion of the program.
down button until printing stops. This function does *nothing if the printer* is off or absent. Turn off the printer when the picture is done to minimize interference during reception.

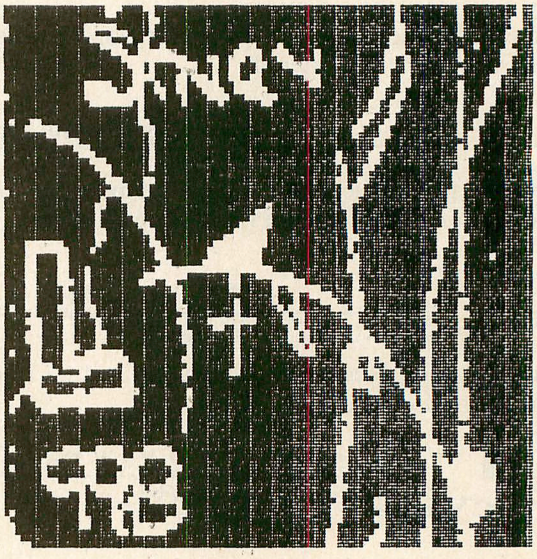
Change this——↓ to change Baud rate:

```
55 POKE150, 1 : REM PRINT=9600 BAUD
```

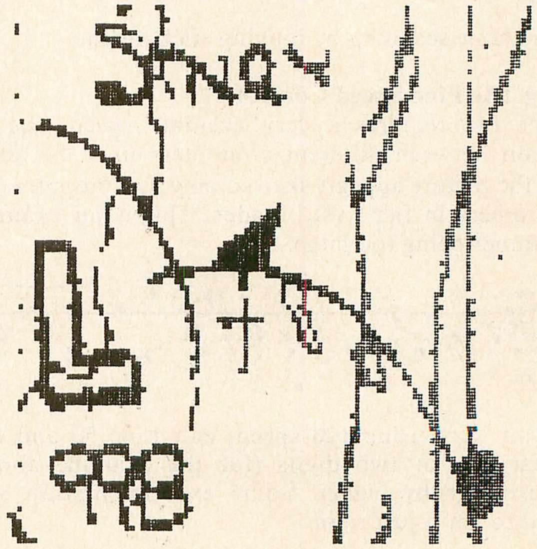
BAUD RATE:	9600	4800	2400	1200	600	300
VALUE:	1	7	18	41	87	180

Reverse Video The Picture

Charts are usually sent on a light background, however, if you get this



select: REVERSE VIDEO THE PICTURE to make it look like this.



This function is useful when printing because large black areas squeeze lots of ink out the ribbon and overheat the printer.

(Note, since this function does not change the information content of the picture, you can do it as many times as you want.)

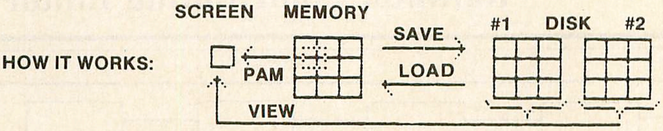
The pictures may be reversed if you are tuned to the wrong sideband for the signal being received. When finished receiving you may want to retune the radio so you won't have to reverse it every time.

Disk Picture Storage

If *WEFAX* Receive is run on a computer with a disk system, the following functions will appear in the menu:

```
DISK     ♦VIEW♦ #1 ♦♦♦ #2 ♦♦♦
PICTURE  ♦LOAD♦    ♦♦♦    ♦♦♦
STORAGE  ♦SAVE♦    ♦♦♦    ♦♦♦
```

These functions allow you to quickly save the pictures for later viewing. No attempt was made to use tape save since it would be hideously slow. There are three disk functions that can be used. Two pictures may be saved on each disk. First, select one of the functions, then select the disk picture that you want it to access. Note: When you use VIEW, you must select one of the nine screens to view. On many charts the title is in the upper right-hand corner, so select the upper right-hand asterisk. For *SAVE* and *LOAD*, you select the whole picture and all the screens in it will be transferred.



There is enough room on each disk to hold both the two pictures and a few other things (like the *WEFAX* program). The pictures will not show up in the disk directory, and if you save too many other things there may not be enough room for the pictures. If there is not enough room the picture will not be saved (you won't see the nine screens flash by). To avoid possible problems, you should probably make up several disks for pictures and copy only the *WEFAX* program onto each.

Use the following procedure to set up a disk:

1) Insert a blank disk in drive 0. Type *DSKINI 0,1* (press the ENTER key). This will initialize and erase the disk.
2) Replace that disk with one containing the *WEFAX*. Type *LOAD "WEFAX"* (press ENTER).
3) Reinsert the blank (initialized) disk. Type *SAVE "WEFAX"* (press ENTER).

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Coast Guard station NMC at Point Reyes, Calif. broadcasts facsimile pictures on 4344.1, 8680.1, 12728.1 and 17149.3 kHz at the following times:

GMT	Eastern	Pacific	
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1715	12:15 pm	9:15 am	Tropical analysis, surface analysis, satellite pictures
2000	3 pm	noon	Fax transmission schedule, 500 millibar contour and maximum wind, satellite pictures
2330	6:30 pm	3:30 pm	Tropical analysis, surface analysis, experimental period
0100	8 pm	5 pm	Surface forecast, sea state forecast, experimental period
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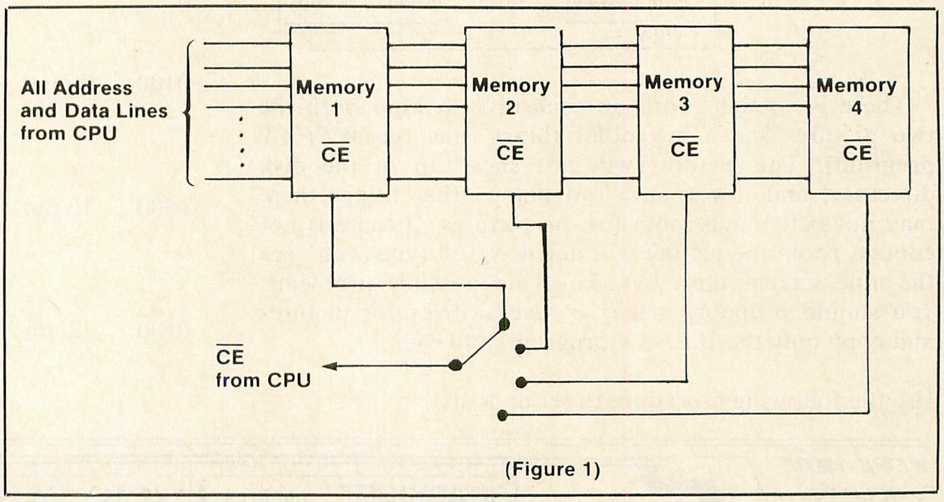
A Look At How The Multi-Pak Interface Works

By Tony DiStefano
Rainbow Contributing Editor

This month we'll be looking at what makes Radio Shack's Multi-Pak Interface (MPI for short) tick, and finish off by adding a little LED numeric display to tell you what slot is active.

First off, a little background on the memory map of the Color Computer is necessary. Judging by the amount of questions I get, the concept of a "memory map" is very confusing to many. Hopefully, after reading this article, the memory map for the Color Computer will be better understood by all.

The CPU in this computer is the MC6809. It has 16 address lines. In binary numbers, 16 bits can have 65,536 different combinations, or 2 to the power of 16. That means the CPU can *directly* access 65,536 (better known as 64K) bytes of memory. The key word here is "directly." At any one time, the CPU will read or write within this boundary, but there is no rule that says we can't fool the CPU into accessing more. To the CPU, it looks like only 64K; to the user the amount of memory the CPU can access can be almost limitless. The secret (not a very big one) is bank switching.



(Figure 1)

A memory chip, be it RAM, ROM, EPROM or whatever, has what is known as a chip enable (CE for short) pin. This pin activates the chip for a read or a write. When this pin is not activated, the chip becomes invisible to the CPU; it is as if it was not there.

Now, think of several chips all in parallel, except for the CE pin. Put all the CE chips on a switch so you can select one at a time (see Figure 1). Changing the switch would mean whatever memory chip was connected by the chip would be activated. This technique allows the user to have access to more than 64K of memory — how much more depends on how many switches you have.

Let's take this one step further. Instead of the manual switch, as in Figure 1, an electronic switch is put in, (see Figure 2) and if this electronic switch could be controlled by the

(Tony DiStefano is well known as an early specialist in computer hardware projects. He lives in Laval Ouest, Quebec.)

computer, it could switch to different chips all by itself. That way, the CPU could actually access more than 64K. All the CPU would have to do is change the electronic select switch.

This is done, of course, in software. The software must know there is more than 64K online. It must also know how to access this memory in reference to where the switches are. This is basically what the Multi-Pak Interface is — an extension of the CPU's memory capacity. It comes complete with mechanical and electrical switches, along with everything else you need to make it work, like a power supply, buffers, wires and connectors, etc.

Now that we know what it can do, let's look at how it does it. In order to understand how the Multi-Pak works, an understanding of the Color Computer memory map is necessary. Note that all versions of the CoCo and CoCo 2 have the same memory map. (Figure 3 shows the memory map.) This is a hardware memory map rather than a software map. The hardware map shows what chips are where and what areas are reserved for them. A software map would show what variables are where, i.e., printer Baud rate, input hook, cassette buffer and so on. Right now we are interested in the hardware map.

The following is a point by point description of the memory map as it is when you turn on the computer. The map can deviate from this with certain commands to the SAM (Synchronous Address Multiplexer) chip, but these are the default settings (on power up). The "$" denotes a Hex number.

1) 0 to 32767 ($0-$7FFF) — This area uses the internal RAM chips. They can be one to two banks of 4K, or 16K DRAM (Dynamic Random Access Memory), or ½ of 64K DRAM.

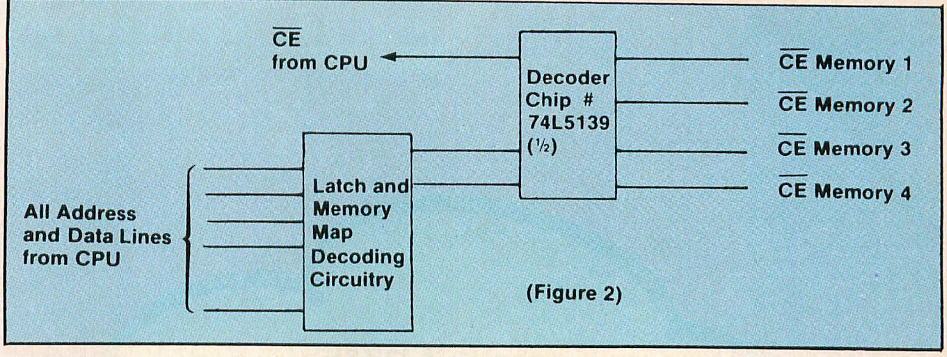
2) 32768 to 40959 ($8000-$9FFF) — This area uses an internal 8K * 8 ROM chip. This space is usually taken up by Extended BASIC.

3) 40960 to 49151 ($A000-$BFFF) — This area uses another internal 8K * 8 ROM chip. This space is occupied by Color BASIC.

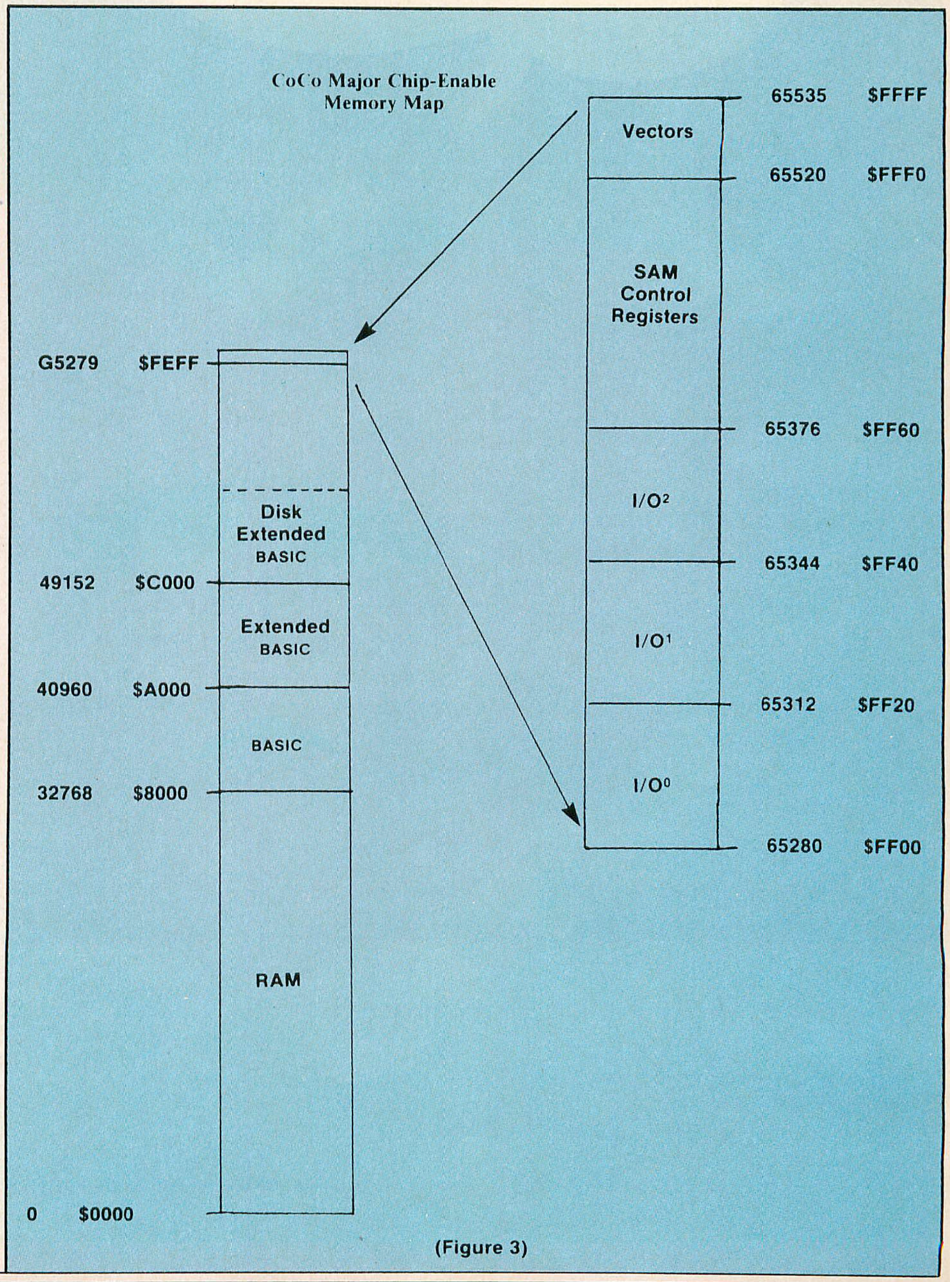
4) 49152 to 65279 ($C000-$FEFF) — This area is 16128 ($3F00) long. It is one page (page = 256 or $100) less than 16K. This area is reserved for external memory. It is accessible via the cartridge connector on the side of the computer. More on this later.

5) 65280 to 65311 ($FF00-$FF1F) — This area is normally used as an I/O port. It is used to control a PIA (Peripheral Interface Adapter). This PIA is connected to the keyboard, analog MUX select lines, horizontal and vertical sync interrupt, joysticks and buttons.

6) 65312 to 65343 ($FF20-$FF3F) — This area is another internal I/O port. The second PIA in this computer, it controls the 6-bit D/A, cassette I/O, RS-232 I/O, RAM size, motor control, sound enable, single bit sound output, graphics mode control and


CE from CPU
Decoder Chip # 74L5139 (½)
CE Memory 1
CE Memory 2
CE Memory 3
CE Memory 4
All Address and Data Lines from CPU
Latch and Memory Map Decoding Circuitry

(Figure 2)


CoCo Major Chip-Enable Memory Map
Vectors
SAM Control Registers
I/O²
I/O¹
I/O⁰
65535 $FFFF
65520 $FFF0
65376 $FF60
65344 $FF40
65312 $FF20
65280 $FF00
G5279 $FEFF
Disk Extended BASIC
49152 $C000
Extended BASIC
40960 $A000
BASIC
32768 $8000
RAM
0 $0000

(Figure 3)

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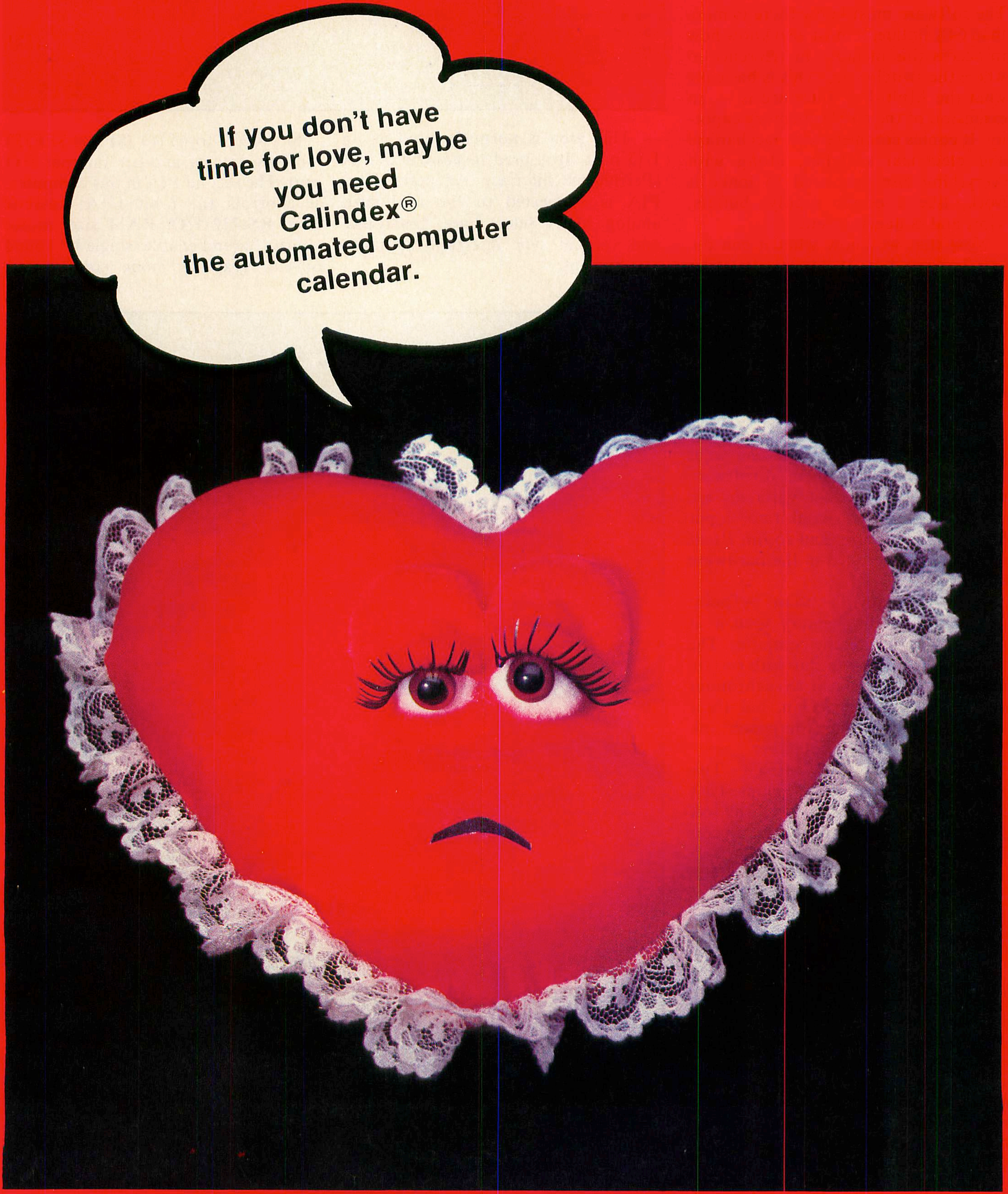
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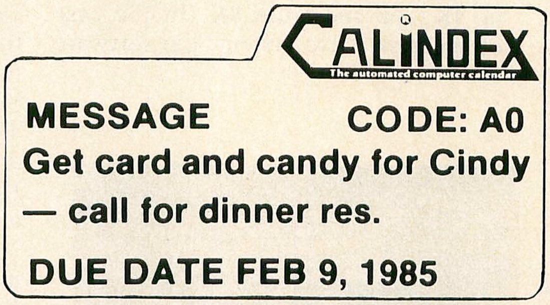
CALINDEX
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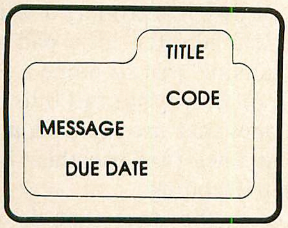
MESSAGE **CODE: A0**
Get card and candy for Cindy
— call for dinner res.
DUE DATE FEB 9, 1985



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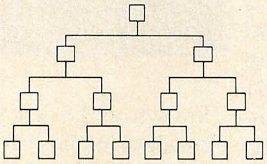

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cartridge interrupt input.

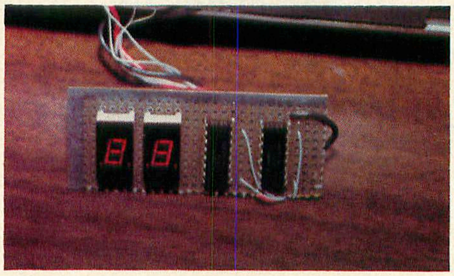
8) 65344 to 65375 ($FF40-$FF5F) — This area is the third I/O port and is reserved for external use. It is accessible via the cartridge connector on the side of the computer. More on this later.

9) 65376 to 65519 ($FF60-$FFEF?) — This area controls the SAM chip. The SAM chip generates all the system timing and all of the device selection.

10) 65520 to 65535 ($FFF0-$FFFF) — Finally, this area is the indirect pointers to the CPU interrupt vectors. Each pointer is two bytes long. Starting from the top, they are: Reset, NMI, SWI, IRQ, FIRQ, SWI2, SWI3 and the last one is Reserved. This area is controlled by the SAM chip and whenever it is accessed, the SAM chip will re-route (re-map) it to 49151 ($BFFF), the top of the Color BASIC area. The reason for this is the CPU must use these vectors, and the only ROM that definitely comes with the computer is this one.

As you can see from the map, the areas that will concern the MPI are #4 and #8. They are accessible through the cartridge port.

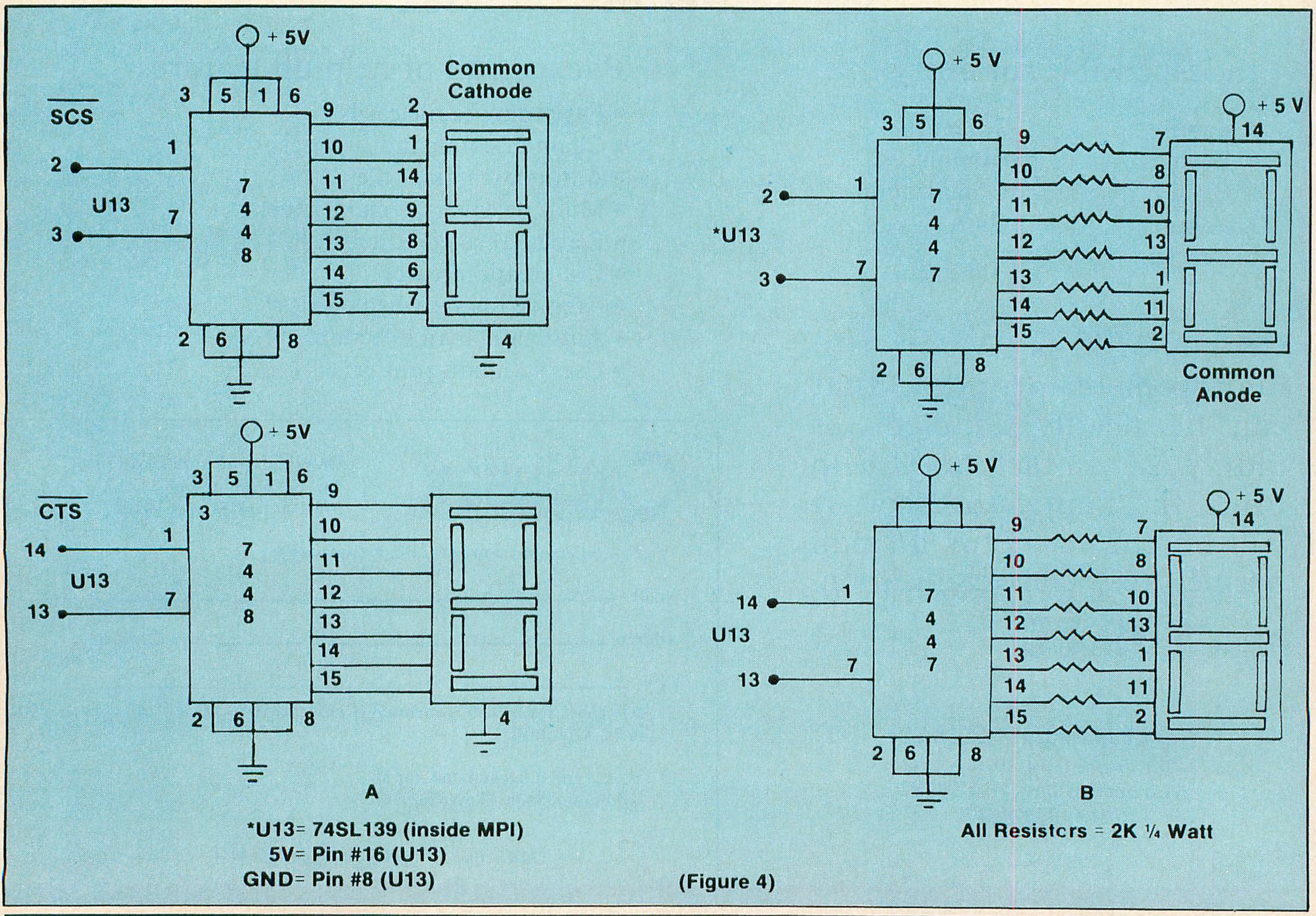
Let's start with #4. The most common use for this area is the ROM-Pak. All of Radio Shack ROM-Paks use this area, however, not all of them use the whole 16K area available. Some use 2K or 4K, but most use 8K. In the case of the disk drive system, the software known as Disk Extended Color BASIC resides in this area. As a matter of interest, this software is kept on an 8K ROM chip, but only uses a little more than 6K of it. The rest of it is blank. The pin that controls (chip enable) this area on the cartridge connector is #32. It is called the Cartridge Select Signal (CTS) and is active LOW.



The second area available to the cartridge port is #8. It is generally used as an I/O port, but can be used for just about anything. The 32 byte length limits it to mostly I/O. Radio Shack game ROM-Paks do not use this area; the disk system does. It uses this area to communicate to the disk controller. Some of my projects also use this area. The pin that controls (chip enable) this area on the cartridge connector is #36. It is called the Spare Select Signal (SCS) and is also active LOW.

There are four slots in the MPI. This means you could put up to four ROM-Paks in there. They don't have to all be ROM-Paks; you could put in a ROM-Pak, a disk controller, a voice-pak, an RS-232 adapter, an x-pad and your own "gizmo," just to name a few. They are all different, but fall into two categories: ones that use the SCS and/or CTS, and ones that use their own memory map decoding.

Let's look at the ones that do use these signals. The MPI has two ways of selecting which slot will be active: 1) The switch in front of the MPI. This is used as a "power up" default switch. When you turn the system on, the slot



*U13= 74SL139 (inside MPI)
5V= Pin #16 (U13)
GND= Pin #8 (U13)

All Resistors = 2K 1/4 Watt

(Figure 4)

that will be active will correspond to the switch's position. If you want the game in slot #2 to run, place the switch to #2 and turn the computer on. 2) The second way to select the active slot is by the built-in electronic switch. The electronic switch is nothing more than a memory-mapped byte. At this location, there is a latch so the associated circuitry can remember what slot is active. This latch is at 65407 ($FF7F). Writing to this byte will change the active slot so it is equal to the value stored in that byte. To change the active slot, a poke or a store will do. You can also read the latch. The value returned will correspond to the active slot.

To make matters more complicated, the SCS and the CTS can be switched separately. Yes, the SCS can be in slot 1 and the CTS in slot 3. The electronic switch is divided into two parts, or nibbles. Each is four bits, making it eight bits, which is equal to one byte. The lower four bits controls the SCS and the upper four bits the CTS. A four-bit binary number can have 16 different combinations, but only the first four are used in the MPI. That makes four ports. The value needed to select a given port must start with zero. This is the first slot, even though the numbers start from one.

To select a slot, a little calculation is necessary. It is, of course, easier in Hex numbers. Here is a table that references the slots.

Slot #	CTS	SCS
1	0 ($0)	0 ($0)
2	16 ($10)	1 ($1)
3	32 ($20)	2 ($2)
4	48 ($30)	3 ($3)

To select a CTS and an SCS is simple: take the value from the CTS column that corresponds to the slot number you want active, and add it to the value of the SCS that corresponds to the slot of that one. For example, if you want the CTS to be in slot 3 and the SCS in slot 2, the sequence would be as follows:

32 ($20) + 1 ($1) = 33 ($21)

You would then *POKE 65407,33* but you must remember when you change slot numbers, the computer might crash. It all depends on what software is running at the time. If, for instance, you were running Disk Extended BASIC and changed the CTS to another slot, a crash would occur and the disk software would no longer be there. If the slot that received control was auto-starting, it may start properly, depending on the status of the interrupts.

> ***"There are four slots in the MPI . . . you could put up to four ROM-Paks in there. They don't have to all be ROM-Paks; you could put in a ROM-Pak, a disk controller, a voice pak, an RS-232 adapter, an x-pad and your own 'gizmo,' just to name a few."***

Now for the project. This is a simple 2-IC circuit. The IC I used in this project is the 7448. It is a BCD (Binary Coded Decimal) to seven-Segment decoder driver. This chip takes a four-bit binary number from zero to nine, and turns on the proper LED display segments to make them look like numbers. This IC can drive the display directly without resistors. It also uses the less expensive common cathode display (RS #276-075).

Unfortunately, the 7448 is not available at Radio Shack. The one available is the 7447 (RS #276-1805). There are two differences between the two: 1) it needs resistors to drive the display, and 2) it drives a common anode (more expensive) display. The choice is yours. If you can find the 7448, then use the common cathode display. If not, then use the 7447 with the common anode display (RS #276-053) and the resistors. Both schematics are shown in Figure 4.

I mounted the ICs and the displays on the same protoboard, as you can see from the photo. I will leave it up to you to mount the display where you want it. The display and the ICs do not have to be on the same board. You could always cut a square hole in the cover and mount the displays there.

To see if the display is working right, with all slots empty, place the front switch to slot #1 and turn the computer and MPI on. The display should read 00. Turn the switch to each position — #2, #3 and #4 — the display should read 11, 22 and 33, respectively. Try *POKEing* different values acording to the Slot Table, and verify that the numbers change accordingly. From now on you will be able to see at a glance which slot is active.

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COMPUTER ISLAND

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A combined and menu driven version of the above programs. Includes play money. Reviewed - Rainbow 7/83

EQUATIONS TUTORS 19.95 EA.
by Ed Guy 32K EB.
Elementary-intermediate algebra. Step by step tutorials. SPECIFY Linear or Quadratic.

GRAPH-IT $14.95 16K EB.
Graph algebraic equations on a hi-res screen. Linear, quadratic, etc. By D. Steele

MATH INVADERS by David Steele
16K EB. $17.95
A multi-level 'Space Invaders' type game to reinforce the 4 basic math operations (addition, subtraction, multiplication and division). Problems become more difficult as you progress. Hi-res. graphics, joystick required.
32K EB. Disk $20.95

THE MATH TUTOR SERIES 16K Ext.
These tutorials take the child through each step of the example. All programs include HELP tables, cursor and graphic aids. All allow user to create the example, or let the computer choose. Multi-level. Great teaching programs. By Ed Guy.

LONG DIVISION TUTOR	$14.95
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FRACTIONS TUTOR (Subtraction)	$19.95
FRACTIONS TUTOR (Multiplication)	$19.95
Any 2 FRACTIONS programs	$29.95

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By Ed Guy $24.95
A step by step tutorial for learning to compute the sides and angles of right triangles. All examples have graphic representation.

GRAPH TUTOR 32K ECB $19.95
Line, bar, pie and pictographs are demonstrated. Learn to read and use these graphs. Test mode, Hi-res graphics throughout. By Chris Phillips.

CROCODILE MATH 16K Ext.
By Art Provost $17.95
An animated math game using hi-res graphics. A fish containing a problem moves toward a crocodile containing a possible answer. If the answer is true, open the crocodile's mouth with the joystick to eat the fish. If false, keep his mouth closed. Addition, subtraction, and multiplication examples on 3 levels, 3 speeds. Tape only.

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SCIENCE GAME $29.95
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First Games contains 6 menu-driven programs to delight and teach your early learners (ages 3-6). These games enrich the learning of colors, numbers, lowercase letters, shapes, memory, visual discrimination and counting.

ARROW GAMES by Penny Bryan
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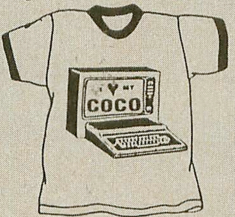

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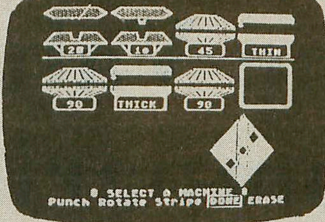

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Grades 4-adult. Winner 1983 Learning Software Award. Recommended in Classroom Computer Learning, Courseware Report Card and Electronic Learning Unique three-level program challenges students to create geometric "products" on a simulated machine assembly line which the student designs. Diskette for 32K TRS-80 Color Computer with Extended Color BASIC. $39.95

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Grades 2-adult. Winner 1983 Learning Software Award. Recommended in Classroom Computer Learing. A small green frog, lost in a pond of lily pads, helps students recognize and articulate patterns, generalize from raw data and think logically. Diskette for 32K TRS-80 Color Computer with Extended Color BASIC. $39.95

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The Value of Comparison Shopping

— a consumer education program for children

By Steve Blyn
Rainbow Contributing Editor

Consumer education was traditionally taught only in the higher grade levels; it was naturally assumed these students were closest to being out in the world and on their own. Although this is true, the topic has fortunately been introduced into the lower grades as well. Educators have learned that one is never too young to learn how to manage money wisely.

Young children are exposed to advertising through television. They see toys and cereals and other products meant to attract their attention. They want almost everything: "Daddy, buy me this, Mommy, buy me that." How familiar these phrases are to parents! And what do we answer? "We don't have room for that toy," or "You have one just like it," or the old standby "It costs too much money!" From the age of 2 or 3, our children begin to build an awareness of products, purchasing and prices.

Shopping for food is a job most youngsters take part in. Many accompany their parents to the supermarkets. There are many others who are able to shop alone at local groceries at surprisingly early ages. Consumer education should therefore begin when it is appropriate to the experiences of the students.

In the metropolitan New York area, the Wednesday and Sunday newspapers are full of ads and discount coupons for the local supermarkets. Hours can be spent combing the ads looking for the best bargains. It would be counterproductive to travel from market to market to get the best value on each particular item. By careful comparison pricing on selected items, people learn more efficiently to choose the better stores for their needs.

This month's program is designed to help middle grade students learn about comparison shopping in two stores. A list containing several grocery items and their prices in each store is presented.

The learner has two tasks to master. First, one must decide which store has the better price. This exercise gives practice in reading this type of list. Adults are quite familiar with such lists, but they can confuse children in the beginning.

Next, the student must determine how much money is saved in the less expensive store. This is done by subtracting either mentally or on a separate piece of paper. The problem is counted right only if both questions are answered correctly. After 10 examples, a report card is given, and the player can begin again or end the program.

Lines 40 and 50 dimension the number of prices and articles. Each article has two prices. Lines 60-100 draw the screen and its information. Line 110 selects the random number (R). This determines which grocery item is picked for each question. This line also contains the counter (CT) for the total number of examples. The next line monitors the counter.

Lines 130-190 ask which store has the cheaper price on the item in question. Lines 200-230 check to see if the answer is correct. If it is, then lines 240-320 ask and check how many cents were saved at the less expensive store. If answered correctly, the student will receive 10 points.

After 10 questions, a report card is given on lines 420-470. Remember that

---

(Steve Blyn teaches both exceptional and gifted children, holds two master's degrees and has won awards for the design of programs to aid the handicapped. He and his wife, Cheryl, own Computer Island.)

a question is only counted as correct if both parts are answered correctly. This was done mainly because of the large screen size. We could only fit in eight items and felt it was too easy to merely memorize which item was cheaper. If you desire, you may easily alter the scoring by giving five points for each part of the two-part question.

This program is certainly not limited to supermarket shopping. The *DATA* lines are on 400 and 410. Line 400 has the two amounts and Line 410 has the item. You may substitute any items and amounts of interest to your children or students.

An even better idea is to let the children have fun and learn by substituting their own items and values. One of the best ways to learn is by being an active participant in the program.

250 209
END 187

The listing:

```
10 REM"COMPARISON SHOPPING"
20 REM"STEVE BLYN,COMPUTER ISLAN
D,NY,1985"
30 CT=0:GB=0
40 DIM A(8,2):'*THE AMOUNTS
50 DIMF$(8):'*THE ITEMS
60 CLS0
70 PRINT" STORE1       STORE2
ITEM":PRINT STRING$(32,188);
80 FORX=1TO8:FORY=1TO2:READ A(X,
Y):NEXTY,X:FORZ=1TO8:READF$(Z):N
EXTZ
90 FOR X=1TO8:FORY=1TO2:PRINT "
";:PRINTUSING "$##.##";A(X,Y);:P
RINT"      ";:NEXTY:PRINTF$(X):NEX
TX
100 PRINTSTRING$(32,179);
110 R=RND(8):CT=CT+1
120 IF CT>10 THEN 420
130 PRINT@352,"  WHICH STORE SEL
LS THE ";F$(R)
140 PRINT@384,"     AT A CHEAPER
PRICE";
150 REM"EN=PLAYER'S RESPONSE"
160 INPUT EN
170 REM"P1=PRICE AT FIRST STORE
AND P2=PRICE AT THE SECOND."
180 IF EN<1 OR EN>2 THEN 130
190 P1=A(R,1):P2=A(R,2)
200 REM"CHECK OUT THE ANSWER"
220 IF P1>P2 THEN N=2
230 IF EN=N THEN 250 ELSE 330
240 REM"IF CORRECT,ASK HOW MUCH
IS SAVED AT THAT STORE."
250 PLAY"L100;GFEGFEDC"
260 PRINT@416," ":PRINT@416,"RIG
HT! HOW MANY CENTS SAVED";
270 INPUT EE
280 IF EE<0 OR EE>99 THEN 240
290 CB=ABS(P1-P2)*100
300 CC=INT((CB)+.5)
310 IF EE=CC THEN PLAY"ABCABC":P
RINT@455,"CORRECT  AGAIN  !!";:G
B=GB+1:GOTO 340
320 IF EE<>CC THEN SOUND10,1:PRI
NT@448,"SORRY,YOU REALLY SAVED";
CC;"CENTS":GOTO340
330 PRINT"SORRY, STORE #";N;" IS
 CHEAPER.":SOUND10,1
340 PRINT@485,"PRESS <ENTER> TO
GO ON";
350 EE$=INKEY$
360 IF EE$=CHR$(13) THEN 380
370 GOTO 350
380 FORT=1376 TO 1535:POKET,128:
NEXT T
390 GOTO 110
400 DATA 1.25,1.33,.84,.79,.64,.
59,2.25,2.39,.62,.49,2.65,2.48,.
87,.84,1.57,1.74
410 DATA CHEESE,CATFOOD,BEANS,CO
FFEE,CANDY,MILK,JUICE,BREAD
420 CLS5:PRINT@41,"REPORT CARD";
430 PRINT@134,"YOUR SCORE WAS";G
B*10;"%";
440 PRINT@357,"PRESS <ENTER> TO
GO ON";
450 EN$=INKEY$
460 IF EN$=CHR$(13) THEN RUN
470 GOTO 450
```

One-Liner Contest Winner . . .

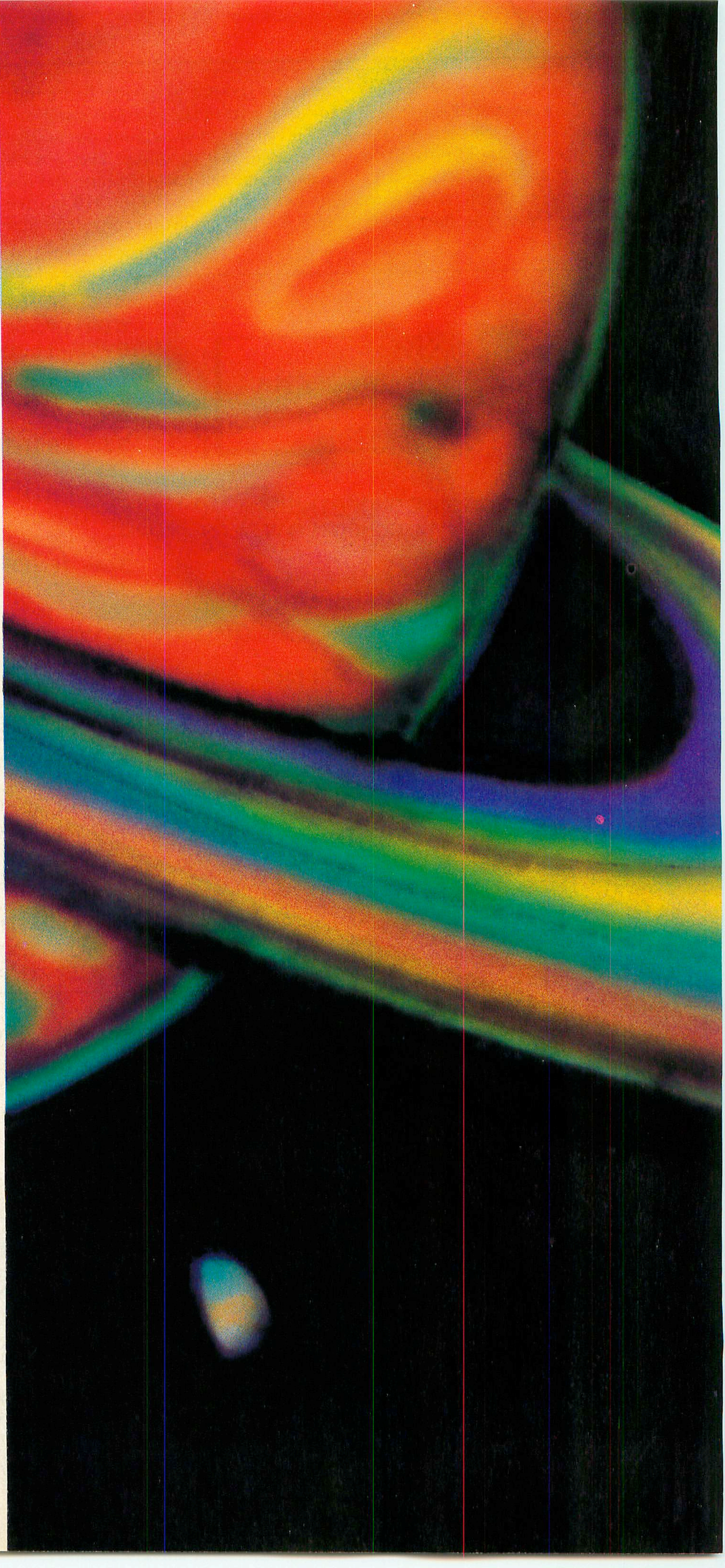
You *can* do 3-D animation on the CoCo! This shortie draws a cube over and over, rotating it a few degrees each time.

Kraig Brockschmidt
Renton, WA

The listing:

```
0 PMODE4:FORO=1TO4:X(O)=COS(A)*4
0+128:X(O+4)=X(O):Y(O)=SIN(A)*15
+75:Y(O+4)=Y(O)+42:A=A+1.6:NEXT:
A=A+1.3962:RESTORE:PCLS:FORO=1TO
12:READS,E:LINE(X(S),Y(S))-(X(E)
,Y(E)),PSET:NEXT:SCREEN1,1:GOTO:
DATA1,2,2,3,3,4,4,1,5,6,6,7,7,8,
8,5,1,5,2,6,3,7,4,8
```

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Simulations* and its companion *Rainbow Simulations Tape*.)



(Dan Hamilton is a free-lance programmer who authored several programs for Chromasette. He is currently exploring possibilities of a career in programming.)

16K
ECB

'Calculate' your way through the solar system with

Space Race

By Daniel Hamilton

Welcome to *Space Race*. This is an interesting math game with a new twist. Instead of answering a math problem, you must enter an equation and the CoCo computes the answer. I borrowed the technique to accomplish this from Rich Dersheimer's *Mathgame* program published in the January 1984 RAINBOW.

The object of the game is simple: be the first player to pilot your spaceship from Earth to Pluto. Each player's turn consists of spinning for three random numbers, then building an equation from the numbers and the arithmetic operators: * / + –. You may only use each number or operator once to form your equation. When your equation is entered, the CoCo computes its value, and moves your spaceship a distance equal to this value. Only the integer portion of the value is used, and values less than zero are ignored. There are two rules that make the game more interesting.

1) If you stop on a planet, you automatically advance to the next planet.
2) If you stop on the same position as your opponent, your opponent is sent back to the previous planet.

This means the equation with the highest value is not necessarily the one that will most improve your position in the race. An exception to rule #2 is that planets are considered safety areas; you cannot be bumped back while you are on a planet.

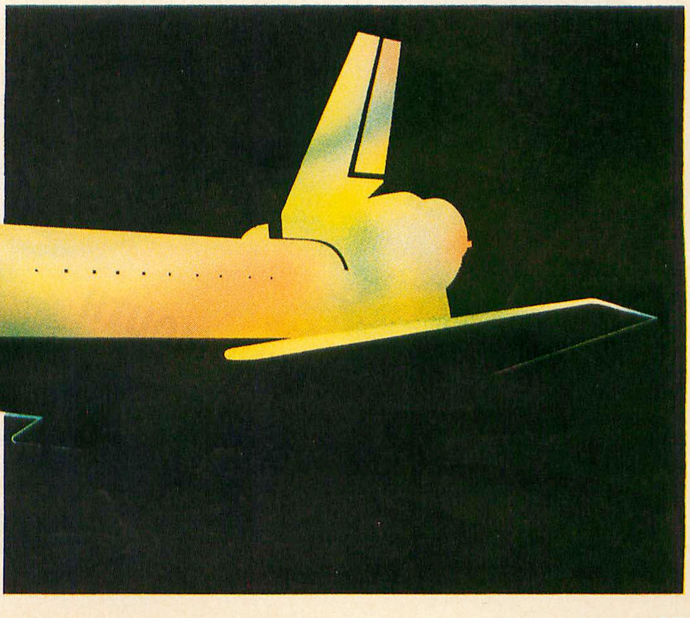
The game can be played by two players, by one person against the computer, or enter "Computer" as the name of the first player and select the one player option, and the computer will play a demonstration game against itself.

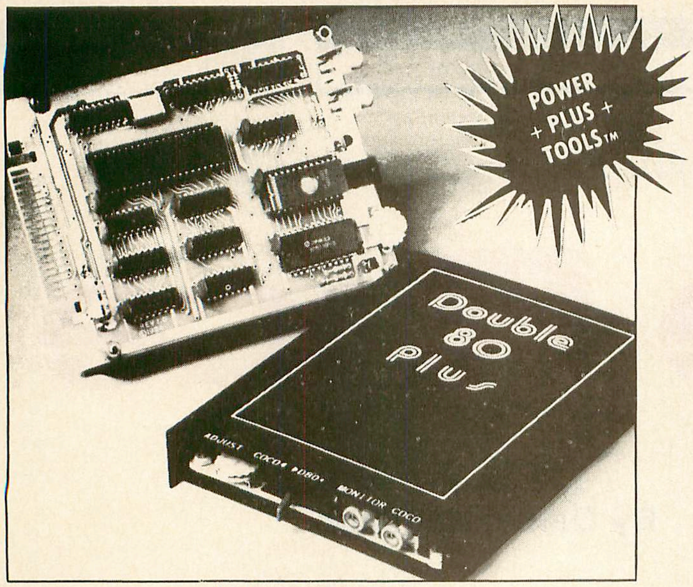
I must apologize for the lack of remarks and all the multiple statement lines. I abhor multiple statement lines because they make the logic difficult to follow, especially in lines with multiple *IF* and *ELSE*.

Unfortunately, the program as I originally wrote it ran over 16K, and I really wanted a game everyone could try, so I packed it all together and stripped out all the remarks to get a version that just barely runs in 16K.

A breakdown of the program follows:

Line 1	Dimension arrays: reseed random function
Line 2	Dummy line to compute input equation
Line 3-4	Locates dummy line
Line 5-9	Initialize variables:input names: select mode of play
Line 10	Draws screen
Line 11	Alternates players (beginning of main loop)
Line 12	Spins for 3 random numbers
Line 13	Stores numbers and operators and draws them on screen
Line 14-17	Gets input equation
Line 18-20	Checks syntax of input equation
Line 21	Inserts input equation in dummy equation
Line 22-24	Evaluate equation and move rocket (end of main loop)
Line 25-26	Subroutine to move player 1 rocket
Line 27-28	Subroutine to move player 2 rocket
Line 29-30	Subroutine to bump back player 2
Line 31-32	Subroutine to bump back player 1





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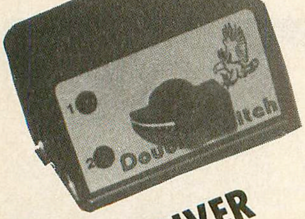
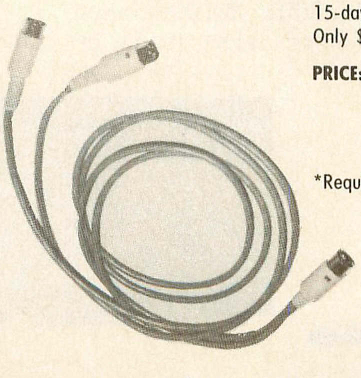
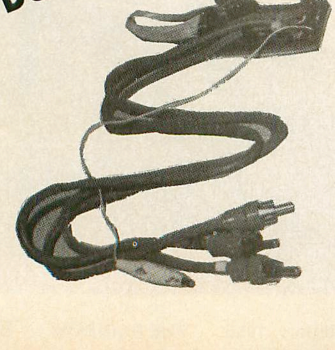


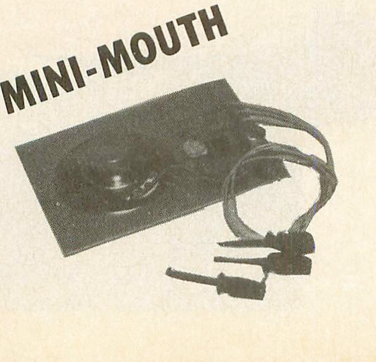
DOUBLE CABLE



DOUBLE DRIVER



MINI-MOUTH



DOUBLE TERM + Plus +

This program is the **ultimate** in CoCo communicating! Double Term + is used with a plug-in 80 column board. Supports either Double 80 Plus, Color Power II or Word Pak.

Here are just some of the features Double Term + has to offer:

Select:
- Half, Full Duplex or Echo
- Odd, Even, Mark, Space or No Parity
- 7 or 8 Bit Words
- 1 or 2 Stop Bits
- All Caps if needed
- Several Printer Formats
- Trapping of incoming characters

BAUD Rates:
- 110-4800 (communicate)
- 600-9600 (printer)

Screen Format:
- 80 x 24 upper/lowercase
- Send all 128 characters from keyboard

Buffer:
- Merge text or programs
- 49K to 53K memory
- Four Buffer Send Modes
- Display Bytes Used/Remaining
- Editor—Move forward and reverse thru buffer. Insert, type over, delete lines, characters or words. Block delete.

10 Macro keys
Automatic Capture of incoming files
X on/X off capabilities
Send True Line Break
Transmit/Receive BASIC Programs, Files or Machine Code. No need to translate BASIC programs to ASCII Format.
Save/Load Macros or Parameters to Disk
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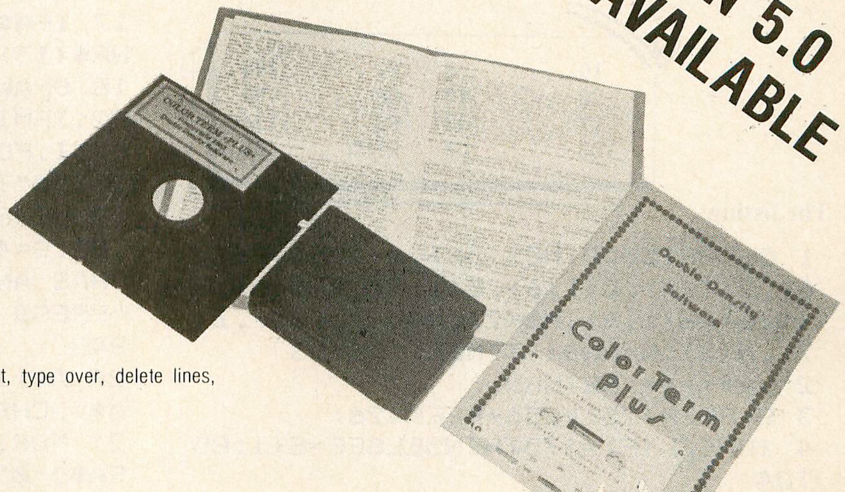
Select:
- Half, Full Duplex or Echo
- Odd, Even, Mark, Space or No Parity
- 7 or 8 Bit Words
- 1 or 2 Stop Bits
- All Caps if needed
- Several Printer Formats
- Trapping of incoming characters

BAUD Rates:
- 110-4800 (communicate)
- 600-9600 (printer)

Screen Format:
- 32 x 16, 42, 51, 64 or 85 x 24
- Send all 128 characters from keyboard

Buffer:
- Merge text or programs
- 49K to 53K memory
- Four Buffer Send Modes
- Display Bytes Used/Remaining
- Editor—Move forward and reverse thru buffer. Insert, type over, delete lines, characters or words. Block delete.



- 10 Macro keys
- Automatic Capture of incoming files
- X on / X off capabilities
- Send True Line Break
- Transmit/Receive BASIC Programs, Files or Machine Code. No need to translate BASIC programs to ASCII Format.
- Save/Load Macros or Parameters to Disk
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Line 33-38	Subroutine to spin for 3 random numbers
Line 39-44	Subroutine to build computer's equation
Line 45-47	Subroutine to draw screen
Line 48	Subroutine to draw text on screen
Line 49-54	Defines text character strings: defines music strings
Line 55-63	Draws rockets and stores them in arrays
Line 64-65	Data
Line 66-67	'End of game' routine

```
10..........8     42 .......190
22 ........17     50 .......110
27 .......103     53 .......154
35 .......107     END ......96
```

The listing:

```
1 CLEAR150:DIMC$(58),A(1,6),B(1,
6),C(1,6),D(1,6),E(1,6),F(1,6),G
(1,6),H(1,6),M$(2),N$(2),P(2),Z(
7),N(3):N=RND(-TIMER):GOTO3
2 V=*****:RETURN
3 E=PEEK(25)*256+PEEK(26)
4 IFPEEK(E)=173THEN5ELSEE=E+1:GO
TO4
5 CLS0:PRINT@267,"space"+CHR$(12
8)+"race";:SCREEN0,1:GOSUB49
6 A=32:B=8:C=32:D=15:P(1)=0:P(2)
=0:F=0:CLS:PRINT@256,"";:INPUT"E
NTER YOUR NAME";N$(1):IFN$(1)=""
THENN$(1)="PLAYER 1"ELSEIFLEN(N$
(1))>8THENN$(1)=LEFT$(N$(1),8)
7 CLS:PRINT@256,"PRESS:  1) TO R
ACE THE COMPUTER";:PRINT@328,"2)
 TO RACE A FRIEND";
8 A$=INKEY$:IFA$<"1"ORA$>"2"THEN
8ELSEIFA$="1"THENN$(2)="COMPUTER
":GOTO10
9 CLS:PRINT@256,"";:INPUT"ENTER
YOUR FRIEND'S NAME";N$(2):IFN$(2
)=""THENN$(2)="PLAYER 2"ELSEIFLE
N(N$(2))>8THENN$(2)=LEFT$(N$(2),
8)
10 GOSUB45
11 IFF<>1THENF=1ELSEF=2
12 GOSUB33
13 FORI=1TO3:Z(I)=N(I)+48:NEXTI:
Z(4)=42:Z(5)=47:Z(6)=43:Z(7)=45:
LINE(40,152)-(255,191),PRESET,BF
:DRAW"BM48,160":FORI=1TO7:DRAWC$
(Z(I)-32)+C$(0):NEXTI:IFN$(F)="C
OMPUTER"THENGOSUB39:GOTO21
14 G=40:H=183:T$="ENTER YOUR EQU
ATION":GOSUB48:H=191:T$="PRESS C
LEAR TO MAKE CHANGES":GOSUB48:L=
48:T=0:E$=""
15 B$="BM"+STR$(L)+",173;"
16 A$=INKEY$:DRAWB$+"NR8C0NR8C1"
:IFA$=""THEN16ELSEIFT=5THEN17ELS
EFORI=1TO7:IFASC(A$)=Z(I)THENDRA
W"BM"+STR$(32+I*16)+",160"+C$(0)
:DRAWB$+C$(Z(I)-32):E$=E$+A$:Z(I
)=0:L=L+8:T=T+1ELSENEXTI
17 IFA$=CHR$(12)THEN13ELSEIFA$=C
HR$(13)ANDT=5THEN18ELSE15
18 DRAWC$(0)+C$(29):FORI=1TO5STE
P2:IFMID$(E$,I,1)<"0"THEN19ELSEN
EXTI:FORI=2TO4STEP2:IFMID$(E$,I,
1)>"0"THEN19ELSENEXTI:GOTO21
19 LINE(40,175)-(255,191),PRESET
,BF:G=40:H=183:T$="THIS EQUATION
 HAS AN ERROR":GOSUB48:H=191:T$=
"PRESS CLEAR TO START OVER":GOSU
B48
20 A$=INKEY$:IFA$=""THEN20ELSEIF
A$<>CHR$(12)THEN19ELSE13
21 FORI=0TO4:A$=MID$(E$,I+1,1):I
FA$>"0"THENPOKEE+I,ASC(A$)ELSEIF
A$="+"THENPOKEE+I,171ELSEIFA$="-
"THENPOKEE+I,172ELSEIFA$="*"THEN
POKEE+I,173ELSEIFA$="/"THENPOKEE
+I,174
22 NEXTI:GOSUB2:V$=STR$(V):FORI=
1TOLEN(V$):DRAWC$(ASC(MID$(V$,I,
1))-32):NEXTI:FORI=0TO4:POKEE+I,
173:NEXTI:LINE(40,175)-(255,191)
,PRESET,BF:IFV<1THEN11ELSEFORI=P
(F)+1TOP(F)+INT(V):ONF GOSUB25,2
7:IFI=300THEN66ELSENEXTI:P(F)=P(
F)+INT(V)
23 IFP(F)/50=INT(P(F)/50)THENG=4
8:H=183:T$="** BONUS **":GOSUB48
:PLAYM$(0):FORI=1TO50:ONF GOSUB2
5,27:NEXTI:P(F)=P(F)+50:IFP(F)=3
00THEN66
24 IFP(1)=P(2)THENIFP(1)/50=INT(
P(1)/50)THEN11ELSEONF GOSUB29,31
:GOTO11ELSE11
25 FORY=32TO128STEP48:IFY=B THEN
26ELSENEXTY:FORJ=1TO2:PUT(A,B)-(
A+15,B+6),C,PSET:PUT(A,B)-(A+15,
B+6),A,PSET:A=A+2:NEXTJ:IFA=232T
HENLINE(A,B)-(A+15,B+6),PRESET,B
F:B=B+24:A=A-20:PUT(A,B)-(A+15,B
+6),E,PSET:RETURNELSERETURN
26 FORJ=1TO2:PUT(A,B)-(A+15,B+6)
,G,PSET:PUT(A,B)-(A+15,B+6),E,PS
ET:A=A-2:NEXTJ:IFA=12THENLINE(A,
B)-(A+15,B+6),PRESET,BF:B=B+24:A
=A+20:PUT(A,B)-(A+15,B+6),A,PSET
:RETURNELSERETURN
27 FORY=39TO135STEP48:IFY=D THEN
28ELSENEXTY:FORJ=1TO2:PUT(C,D)-(
C+15,D+6),D,PSET:PUT(C,D)-(C+15,
D+6),B,PSET:C=C+2:NEXTJ:IFC=232T
HENLINE(C,D)-(C+15,D+6),PRESET,B
```

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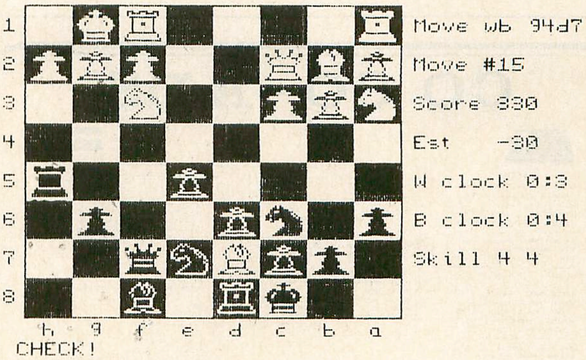

```
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Move #15
Score 330
Est    -30
W clock 0:3
B clock 0:4
Skill 4 4
CHECK!
```

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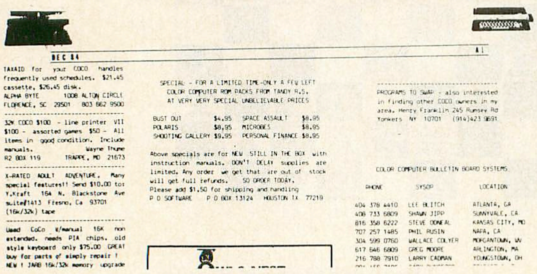
```
F:D=D+24:C=C-20:PUT(C,D)-(C+15,D
+6),F,PSET:RETURNELSERETURN
28 FORJ=1TO2:PUT(C,D)-(C+15,D+6)
,H,PSET:PUT(C,D)-(C+15,D+6),F,PS
ET:C=C-2:NEXTJ:IFC=12THENLINE(C,
D)-(C+15,D+6),PRESET,BF:D=D+24:C
=C+20:PUT(C,D)-(C+15,D+6),B,PSET
:RETURNELSERETURN
29 LINE(C,D)-(C+15,D+6),PRESET,B
F:FORY=39TO135STEP48:IFY=D THENP
(2)=P(2)-(212-C)/4:C=212:PUT(C,D
)-(C+15,D+6),F,PSETELSENEXTY:P(2
)=P(2)-(C-32)/4:C=32:PUT(C,D)-(C
+15,D+6),B,PSET
30 G=48:H=183:PLAYM$(1):T$="TOO
BAD FOR "+N$(2):GOSUB48:RETURN
31 LINE(A,B)-(A+15,B+6),PRESET,B
F:FORY=32TO128STEP48:IFY=B THENP
(1)=P(1)-(212-A)/4:A=212:PUT(A,B
)-(A+15,B+6),E,PSETELSENEXTY:P(1
)=P(1)-(A-32)/4:A=32:PUT(A,B)-(A
+15,B+6),A,PSET
32 G=48:H=183:PLAYM$(1):T$="TOO
BAD FOR "+N$(1):GOSUB48:RETURN
33 LINE(40,0)-(255,6),PRESET,BF:
LINE(40,152)-(255,191),PRESET,BF
34 FORJ=1TO2:P$=STR$(P(J)):G=40+
(J-1)*112:H=6:T$=N$(J):GOSUB48:D
RAWC$(29):FORI=2TOLEN(P$):DRAWC$
(ASC(MID$(P$,I,1))-32):NEXTI,J:G
=176:H=167:T$=N$(F)+"'S":GOSUB48
:H=175:T$="TURN":GOSUB48:H=183:T
$="TO SPIN.":GOSUB48
35 FORI=60TO140STEP40:CIRCLE(I,1
68),10:NEXTI:IFN$(F)="COMPUTER"T
HENG=56:H=191:T$="*SPINNING*":GO
SUB48:GOTO37ELSEG=40:H=191:T$="P
RESS ENTER TO SPIN.":GOSUB48
36 A$=INKEY$:IFA$<>CHR$(13)THEN3
6
37 LINE(40,184)-(255,191),PRESET
,BF
38 FORI=1TO3:FORJ=1TO10:N=3*RND(
3)-3+I:DRAW"BM"+STR$(18+I*40)+",
171;"+C$(0)+"BL8"+C$(16+N):PLAY"
L255O1C":NEXTJ:N(I)=N:PLAY"O5CBC
":NEXTI:FORI=1TO250:NEXTI:RETURN
39 G=56:H=183:T$="*THINKING - ST
AND BY*":GOSUB48:IFF=1THENO=2ELS
EO=1
40 R=P(F)-P(O):S=P(O)-(INT(P(O)/
50)*50):M=0:RESTORE
41 FORX=1TO6:READI,J,K:V=N(I)*N(
J)+N(K):P=42:Q=43:GOSUB43:V=N(I)
*N(J)-N(K):Q=45:GOSUB43:V=N(I)*N
(J)/N(K):Q=47:GOSUB43:V=N(I)-N(J
)*N(K):P=45:Q=42:GOSUB43:V=N(I)-
N(J)+N(K):Q=43:GOSUB43:V=N(I)-N(
J)/N(K):Q=47:GOSUB43:V=N(I)/N(J)
+N(K):P=47
42 Q=43:GOSUB43:V=N(I)/N(J)-N(K)
:Q=45:GOSUB43:NEXTX:LINE(40,161)
-(255,183),PRESET,BF:G=48:H=173:
T$=E$+" =":GOSUB48:RETURN
43 V=INT(V):IFV<=0THENRETURNELSE
IFP(F)+V=P(O)ANDS>R+M THENM=S-R:
GOTO44ELSEIF(P(F)+V)/50=INT((P(F
)+V)/50)ANDP(F)+V+50>M+P(F)THENM
=V+50:GOTO44ELSEIFV>M THENM=V:GO
TO44ELSERETURN
44 E$=CHR$(N(I)+48)+CHR$(P)+CHR$
(N(J)+48)+CHR$(Q)+CHR$(N(K)+48):
RETURN
45 PMODE3,1:PCLS:FORI=12TO156STE
P24:READX:CIRCLE(X,I),14,,.9:PAI
NT(X,I),RND(2)+1,4:NEXTI:PMODE4,
1:SCREEN1,1:FORH=31TO175STEP24:R
EADG,T$:GOSUB48:NEXTH:FORI=23TO1
19STEP48:LINE(36,I)-(240,I),PSET
:LINE(16,I+24)-(220,I+24),PSET
46 FORJ=0TO49:IFINT(J/5)=J/5THEN
K=2ELSEK=0
47 LINE(240-J*4,I+1+K)-(240-J*4,
I-1),PSET:LINE(16+J*4,I+25+K)-(1
6+J*4,I+23),PSET:NEXTJ,I:PMODE3,
1:COLOR1,4:FORH=14TO158STEP24:RE
ADG,T$:GOSUB48:NEXTH:COLOR4,1:PM
```



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```
ODE4,1:PUT(32,8)-(47,14),A,PSET:
PUT(32,15)-(47,21),B,PSET:RETURN
48 DRAW"BM"+STR$(G)+","+STR$(H)+
";":FORK=1TOLEN(T$):DRAWC$(ASC(M
ID$(T$,K,1))-32):PLAY"L100O5E":N
EXTK:PLAY"C":RETURN
49 C$(0)="C0U6RD6RU6RD6RU6RD6BR3
C1":C$(7)="BR2BU4U2RD2BD4BR5":C$
(10)="BR2U6D3NH2NG2NE2F2BDBR4":C
$(11)="BU3R5L3ND2U2RD4BDBR5":C$(
13)="BU3R5BD3BR3":C$(14)="URDBR7
":C$(15)="E5BD5BR3":C$(16)="BUU4
NF4ER3FD4GL3BR7"
50 C$(17)="BR3RU6NGD6RBR3":C$(18
)="BU5ER3FDG2L2GDR5BR3":C$(19)="
BU5ER3FDGNLFDGL3HBDBR8":C$(20)="
BU6D3R4NU3NRD3BR4":C$(21)="BU6NR
5D2R4FD2GL3HBDBR8":C$(22)="BUU4E
R3FBD2BLNL3FDGL3BR7":C$(23)="BU6
R5DG4DBR7":C$(24)="BUUEHUER3FDGN
L2FDGL3BR7"
51 C$(25)="BUFR3EU4HL3GDFR4BD3BR
3":C$(29)="BU2R5BU2L5BD4BR8":C$(
33)="U5ER3FD2NL4D3BR3":C$(34)="U
6R5FDGNL3FDGL4BR8":C$(35)="BUU4E
R3FBD4GL3BR7":C$(36)="U6R3F2D2G2
L3BR8":C$(37)="U6NR5D3NR4D3R5BR3
":C$(38)="U3NR4U3R5BD6BR3"
52 C$(39)="BUU4ER3FBD2NL2D2GL3BR
7":C$(40)="U6BR5D3NL5D3BR3":C$(4
1)="BR2R2LU6LR2BD6BR4":C$(42)="B
U2DFR3EU5BD6BR3":C$(43)="U6BR5G4
EF3BR3":C$(44)="NU6R5BR3":C$(45)
="U6F2RE2D6BR3":C$(46)="U6F5DU6B
D6BR3":C$(47)="BUU4ER3FD4GL3BR7"
:C$(48)="U6R4FDGL4D3BR8"
53 C$(49)="BUU4ER3FD3GNHNFGL2BR7
":C$(50)="U6R4FDGL3RF3BR3":C$(51
)="BUFR3EUHL3HUER3FBD5BR3":C$(52
)="BR2U6L2R5L2D6BR5":C$(53)="BUU
5BR5D5GL3BR7":C$(54)="BU6D2BFDBF
DRUBEUBEU2BD6BR3":C$(55)="NU6E2R
F2NU6BR3":C$(56)="UE4RUBL5DRF4DB
R3"
54 C$(57)="BU6DF2ND3RND3E2UBD6BR
3":C$(58)="BU6R5DG5R5BR3":M$(0)=
"T4L8O3GP8L32GP32GP32O4L4CT2":M$
(1)="T3L4O1BB-AA-L2GT2":M$(2)="T
12O2L4AP4L4AAO3L1CO2AO3L3CO2AO3C
L1ECL3ECEL1GO2GL3O3CO2GO3CL1ET2"
55 FORX=1TO6:READI,J,K:NEXTX:FOR
I=1TO8:PMODE3,1:PCLS:READA$:DRAW
A$:PMODE4,1:ONI GOSUB56,57,58,59
,60,61,62,63:NEXTI:RETURN
56 GET(0,0)-(15,6),A:RETURN
57 GET(0,0)-(15,6),B:RETURN
58 GET(0,0)-(15,6),C:RETURN
59 GET(0,0)-(15,6),D:RETURN
60 GET(0,0)-(15,6),E:RETURN
61 GET(0,0)-(15,6),F:RETURN
62 GET(0,0)-(15,6),G:RETURN
63 GET(0,0)-(15,6),H:RETURN
64 DATA1,2,3,2,3,1,3,1,2,1,3,2,2
,1,3,3,2,1,"BM3,6;C2E3NH3L2R8L2U
L4D2R4","BM3,6;C3E3NH3L2R8L2UL4D
2R4","BM3,6;C2E3NH3C4NL6C2R6L2UL
4D2R4","BM3,6;C3E3NH3C4NL6C3R6L2
UL4D2R4","BM10,6;C2H3NE3R2L8R2UR
4D2L4","BM10,6;C3H3NE3R2L8R2UR4D
2L4"
65 DATA"BM10,6;C2H3NE3C4NR6C2L6R
2UR4D2L4","BM10,6:C3H3NE3C4NR6C3
L6R2UR4D2L4",16,240,16,240,16,24
0,16,1,EARTH,223,MARS,1,JUPITER,
207,SATURN,1,URANUS,199,NEPTUNE,
1,PLUTO,14,O,234,5O,6,1OO,230,15
O,6,2OO,230,25O,6,3OO
66 PLAYM$(2):PCLS:G=32:H=100:T$=
"HOORAY    HOORAY    HOORAY":GOSUB
48:H=116:G=(88-LEN(N$(F))*8)/2:T
$=N$(F)+" WINS THE SPACE RACE":G
OSUB48:G=24:H=148:T$="PRESS ENTE
R TO PLAY AGAIN.":GOSUB48
67 A$=INKEY$:IFA$<>CHR$(13)THEN6
7ELSERUN
```

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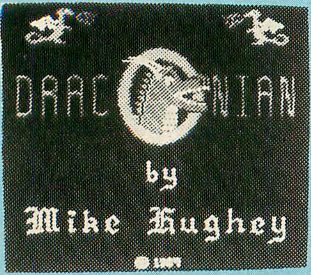
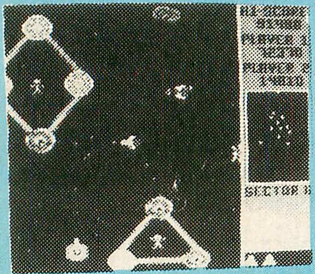




DRACONIAN

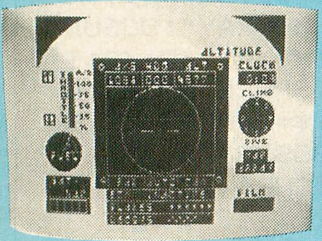
You brace yourself as your ship materializes in the enemy sector. Your engine roars to life, and you consult the long-range scanner for the position of the nearest enemy base. As you head for the base, blasting asteroids and space-mines in your path, you suddenly notice a monstrous space-dragon looming before you. Reacting quickly, you dodge his deadly fire-breath and blast him out of existence.

This is it — the single most impressive, awe-inspiring arcade game you can buy for your Color Computer. High-resolution graphics, awesome sound effects, four-voice music, and quality you have to see to believe! Experience the realism of DRACONIAN today!

JOYSTICKS REQUIRED

32K MACHINE LANGUAGE

TAPE $27.95 DISK $30.95



SR-71

SR-71 is a fast action game in which you are the pilot on a mission to take photographs of missile sites in Russia and deliver them to our processing laboratory in Japan. So real you will feel as if you are in the cockpit on a real spy mission. Elude Russian missiles as well as their detection devices. Another Tom Mix exclusive. A must for the adventurous. Fantastic graphics, color and sound. **32K Ext. Basic.**

TAPE $28.95 DISK $31.95

New From Tom Mix

Worlds of Flight

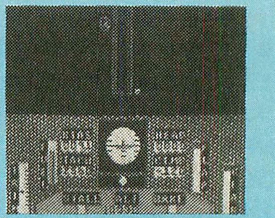
Not A Game — A Very Realistic Flight Simulation

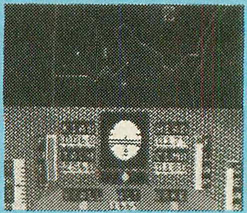
WORLDS OF FLIGHT (WOF) is a "view" oriented flight simulation for the TRS-80 Color Computer, written entirely in Machine Language. "View" oriented means that the pilot may determine his or her position by actually viewing the surrounding landmarks as opposed to using instruments which sense navigational references. This is a major departure from "instrument only" simulations which can be achieved through BASIC programs. Most instrument maneuvers and procedures may be practiced. The craft is a light-weight, single-engine airplane with low wings. A nose wheel which is both steerable and retractable is also modeled. Some aerobatics are possible including sustained inverted flight, aileron rolls, spins and stalls.

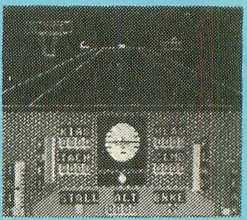
JOYSTICKS REQUIRED

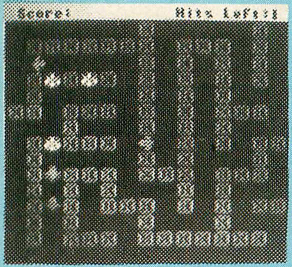
32K MACHINE LANGUAGE

TAPE $29.95 DISK $32.95









WAREHOUSE MUTANTS

Journey through the warehouse seeking out the Mutants who are out to destroy you. WATCH OUT! They will push crates trying to crush you! Outstanding realism—high resolution graphics—multiple screens.

JOYSTICKS REQUIRED

16K MACH. LANGUAGE

TAPE $24.95

DISK $27.95

QUIX

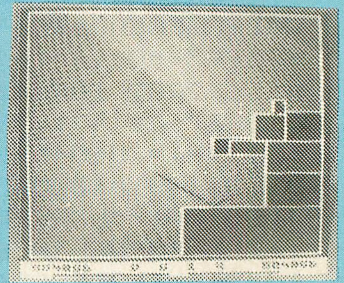
This one is after a popular arcade game with a similar name. Simply frustrating—you'll love it. Done in high resolution graphics with Super Sound.

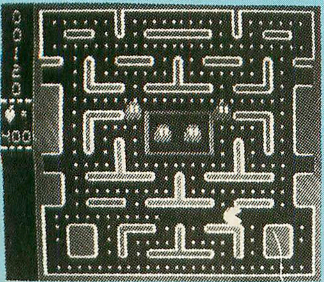
JOYSTICKS REQUIRED

32K MACH. LANGUAGE

TAPE $24.95

DISK $27.95





MS. MAZE

MS. MAZE is remarkable in that it combines brilliant color, high resolution, detailed graphics, and music with a very playable game. Anything that could be done to make the Color Computer look and play like the arcade version has been done. MS. MAZE is without question the closest thing to the arcade Pac games that I have seen for the Coco.

JOYSTICKS REQUIRED

32K MACHINE LANGUAGE

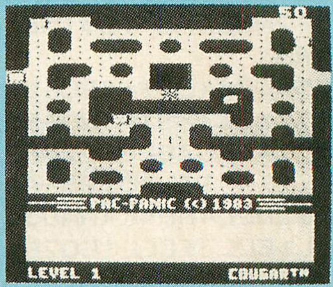
TAPE $24.95 DISK $27.95

PAK-PANIC

Pakman is steered thru a maze eating dots and powerpills. Pakman is pursued by four monsters who try to catch and kill him. If Pakman eats a powerpill he becomes powerful and can eat monsters. Monsters try to avoid a powerful Pakman. As monsters are eaten their ghosts appear on the top of the screen. When seven ghosts have appeared one will fly across the screen or they will link together forming a centipede that will travel thru the maze. Pakman has no power against ghosts and centipedes and must avoid them or be killed. **JOYSTICKS REQUIRED**

32K MACHINE LANGUAGE

TAPE $24.95 DISK $27.95



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QUALITY EDUCATIONAL SOFTWARE

VOCABULARY MANAGEMENT SYSTEM

16K Extended basic/32K for printer output

The Vocabulary Management System (VMS) is a series of programs designed to aid a parent or teacher in helping children to learn and practice using vocabulary and spelling words. The 11 programs that comprise the VMS include a full feature data entry/edit program, three printer output programs and 5 vocabulary/spelling game programs. The system's many outstanding features include:

—As many as 300 vocabulary words and definitions may be in the computer's memory at one time.

—Words and definitions may be saved on disk or tape.

—Remarks and/or comments can be saved with word files.

—A disk loading menu allows students to load disk files without typing file names.

—Word lists may be quickly alphabetized.

—The three printer segments allow you to create and print individualized tests, puzzles, word-searches and worksheets.

—The printer segments allow full use of your printer's special features.

—The 5 game programs are based on sound educational principles and provide practice in identifying words and matching them with their definitions in a fast-paced set of activities.

TAPE $39.95 DISK $42.95

FRACTIONS - A Three Program Package - 32 K EXT. BASIC TAPE $30.95 DISK $35.95

MIXED & IMPROPER

1. Review converting mixed numerals and improper fractions.
2. Practice converting mixed numerals to improper fractions.
3. Practice converting improper fractions to mixed numerals.
4. Practice of both types. (Mixed to improper & improper to mixed)
5. Review converting mixed numerals to mixed numerals. (Used in regrouping in substraction)
6. Practice converting mixed numerals to mixed numerals.

EQUIVALENCE

1. Definitions of terms and review of finding equivalent fractions.
2. Practice finding equivalent fractions.
3. Practice finding sets of equivalent fractions.
4. Review of finding if one fraction is equal to, not equal to, less than or greater than another.
5. Practice finding if one fraction is equal to, not equal to, less than or greater than another.

LOWEST TERMS

1. Review of placing fractions into lowest terms by finding the greatest common factor (GCF) of the numerator and denominator.
2. Practice finding the GCF of pairs of numbers.
3. Practice placing fractions into lowest terms by finding the GCF of the numerator and denominator.

TEACHER'S DATABASE

TEACHER'S DATABASE is a program designed to allow a teacher to keep a computerized file of information about his/her students. There are many features that make this program particularly attractive:

- Information on as many as 100 students (or more) may be in the computer at one time.
- Each student may have as many as 20 (or more) individual items of data in his/her record.
- The program will run from cassette or disk.
- Cassette and disk files are completely compatible.
- The program is menu driven.
- Records may be easily changed, deleted, combined or added.
- Information about students may be numerical or text.
- Records may be quickly alphabetized.
- Records may be sorted by various criteria.
- Records may be reordered (ranked) based on test scores or other data.
- Data displayed during a sort may be printed on a printer or saved on disk or cassette as a new file.
- A full statistical analysis of data may be done and sent to the printer.
- Student test scores may be weighted.

REQURES 32K EXT. BASIC
TAPE $39.95 DISK $42.95

MATH DUEL

MATH DUEL is a challenging mathematics game that pits you against the computer it a game of wits. You must use all of your knowledge of factors, multiples and prime numbers to develop a strategy that allows you to gather more numbers and thus more points that than the computer.

The game is deceptively simple. You select the size of the playing field that is composed of from 8 to 100 numbers. You must then choose numbers that will give you the maximum number of points and the computer the least number of points. There are only 6 rules.

1. Any number that you chose must have at least one factor still on the playing field.
2. You receive points equal to the face value of the number that you chose.
3. The computer receives points equal to the face value of all of the remaining factors of the number that you chose.
4. All of the numbers that were awarded to you or to the computer are removed from the field.
5. The game continues until there are no numbers with factors remaining.
6. At the end the computer receives points equal to the value of all of the remaining numbers.

32K EXT. BASIC TAPE $24.95 DISK $29.95

ESTIMATE

ESTIMATE is a program designed to help children to practice estimating the answers to addition, subtraction, multiplication and division problems on the Color Computer. it has many features that make its use particularly attractive.

- Up to 5 students may use the program at the same time.
- There are 5, user modifiable, skill levels.
- The acceptable percent error may be changed as a student's skill improves.
- A timer measures the number of seconds used to answer each problem and the total time used for a series of problems.
- If a problem has been answered incorrectly, the student is told the percent error and asked to try again.
- If a problem is answered incorrectly a second time, the student is told the correct answer and the range of acceptable answers is displayed.
- A report is given at the end of each set of problems that includes the number of problems done, the number of problems answered correctly on the first try and the average percent error.
- The (BREAK) key has been disabled so that child will not inadvertently stop the program from running. **REQUIRES 16K EXT. BASIC**

TAPE $19.95 DISK $22.95

PRE-ALGEBRA I INTEGERS

INTEGERS is a series of four programs designed to give students practice in working with addition, subtraction, multiplication, division and the comparison of integers. It has many features that make a very valuable tool for introducing and/or maintaining skills.

- Up to 4 students may use the program at the same time.
- There are 9, user modifiable, skill levels.
- Students are given two opportunities to answer a problem.
- A detailed report of student performance, including number correct on first try, number wrong, total time used and percentage score, is presented at the end of a series of problems.
- The programs will run on a 16K TRS-80 Color Computer with or without disk drive.

Four distinct problem formats are presented. The first presents problems in this format: −12 + −9 = ? The second program presents a problem with missing numerals in this format: −7 − ? = 18. The third program presents a problem with a missing sign: 8 − ?6 = 14. The last program asks the student to determine the relationship (=, ◄ or ►) between two statements 3 −9 (??) −4 −5.

32K EXT. BASIC
TAPE $28.95 DISK $33.95

PRE-ALGEBRA II

The second **PRE-ALGEBRA PACK** is composed of two programs, EQUATION SOLVER AND EQUATION DUEL, that are designed to give students practice in using and solving equations. It has many features that make a very valuable tool for introducing and/or maintaining skills:

- In both programs students may choose the range of numerical values that will be included in the equations so that the difficulty may change as their skill increases.
- In EQUATION SOLVER the computer secretely generates a random equation, shows the numbers that it used in the equation and the answer and challenges the student to create his/her own equation that uses the same numbers and results in the same answer.
- In EQUATION DUEL the student and the computer race to see who will be the first to create an equation from the same set of random numbers.
- Both programs give detailed reports of the student's and the computer's performance in creating and solving equations including time used, score and percentage correct.

32K EXT. BASIC
TAPE $28.95 DISK $33.95

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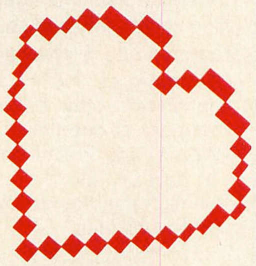
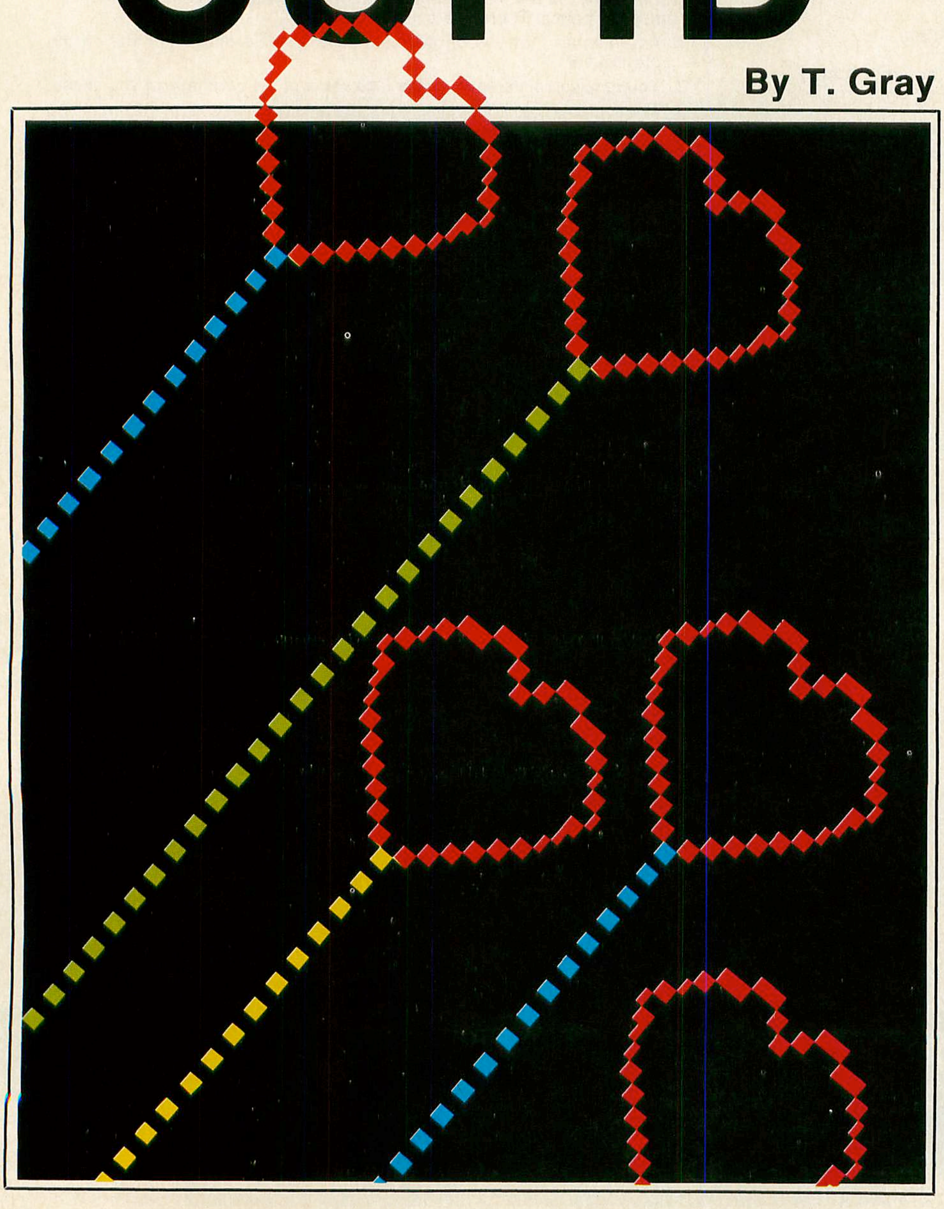
WRITE FOR FREE CATALOGUE - MOST OF OUR INVENTORY IS NOT SHOWN HERE!

In keeping with the gentle traditions that put February 14 in the business of love and romance, here's a program to make your heart flutter — it turns CoCo into a . . .



COMPUTER CUPID

By T. Gray



This game will help you sort out your love life and find the girl or boy of your dreams! The teen-tested program was written for a "Wake-a-thon" held at a junior high school. Popular with boys, girls and chaperones alike, *Computer Cupid* was played for hours that night, and has been requested many times since.

Once you are past the cover screen, you will be asked to enter some vital personal information: your name and sex. You must then rate your "ideal" match on a variety of characteristics, following the prompts from the computer (lines 925 on). This standard will be used later on in the program, so it is important you give this some thought.

The characteristics used for the ideal match are based on lists made by junior high school students. The original version of *Computer Cupid* allowed the user to enter characteristics. After consultation with the students, it was revised to make it shorter and simpler. Feel free to change the characteristics as you and your friends see fit (lines 980 through 1045).

On a Scale of 1 to 10

Now comes the fun part. Again following the prompts, enter the names of some potential partners. You can enter as many as you want, but more than 10 takes a lot of time. You will rate each of those potential partners, as you did for your ideal match, with a rank of one to 10 on each of the qualities specified. Should you get carried away and seriously overrate or underrate a person here, the program will let you know about it. The routine that searches for a "perfect 10" asks the user to alert one of our teachers here at Thorsby Juniour High, who always claims he won't get married until he meets "the perfect woman." I've left his

---

(Tom Gray has bachelor's degrees in psychology and education. He teaches science and math at Thorsby Juniour High School in Sunnybrook, Alberta.)

name in (Line 1155), but substitute *The Guinness Book of World Records*, or the name of your choice.

A Serious Side

The ratings for each person are now compared with your "ideal." Although some users of this program have made acid comments about the rating system, this section has a serious side. It is based on a method used by counselors to help people with serious life decisions. The client is asked to identify a number of important aspects of the problem, and weigh the seriousness of each aspect. Various solutions are then generated. Each solution is rated as to how well it satisfies each aspect of the "ideal" solution, and the results multiplied by the amount of each rating. The outcome is a score for each potential solution.

These scores have no particular value; they are used by the counselor as a basis for discussion to help with the decision-making process. I have personally used this method in my work and in my life, and have found it helpful.

However, *Computer Cupid* is simply a parlor game, and is not meant to be anything but entertainment.

Back to BASIC

In *Computer Cupid*, the importance of a given characteristic (the rating on the "ideal") is multiplied by the rating on that characteristic for a given person. The results are added up for a total score for that person. Once all your prospects have been scored, the totals are compared, and the person with the highest score is selected as the best choice.

The name of your chosen one is teasingly and attractively displayed at the end of the program. *Computer Cupid* will be an enjoyable part of your Valentine's Day party, or just for fun the next time you have friends over.

List Of Variables

ANS$ — Response in replay subroutine
BL — Bottom line
C — Screen color
CH$(X) — Characteristic or quality X
CHOICE$ — Name of highest-rated person
F — Flag used in weighting
FLAG — Flag used in name flash routine
IMP (X) — The importance of characteristic X
K — Counter in centering subroutine
L,L1,L2, L3,L4 — Various screen locations
N — Rating input
NQ — Number of qualities
NT — Number of names rated
N$ — Temporary string storage for centering and name-flash
R(X,Y) — Rating of name X on quality Y
S — Screen location counter in teaser, counter in save subroutine
Score(X) — The weighted score for person X
SBJ$,OBJ$, PS$ — Subject, object, and possessive form of TS$ (e.g., he, him, his for boy)
T$ — Used to label titles
T1$,T2$,T3$ — Words used in cover screen
TN(X)$ — Target names
UN$ — User name
US$ — User sex (boy/girl)
W,X,Y,Z — Miscellaneous counters
W$ — Title in wait subroutine
X$ — *INKEY$* marker

120	175
340	95
415	156
540	183
735	23
800	228
985	197
1095	249
1155	162
END	209

The listing:

```
1 '*=*=*=*=*=*=*=*=*=*=*=*=*=*=*
2 '
3 '         COMPUTER CUPID
4 '          VERSION  2.2
5 '
6 '            BY T. GRAY
7 '
8 '*=*=*=*=*=*=*=*=*=*=*=*=*=*=*
9 '
10 '
15 CLEAR 3000
20 GOSUB100 'INITIALIZE
25 GOSUB200 'COVER SCREEN
30 GOSUB300 'INPUT PERSONAL DATA
35 GOSUB400 'INPUT NAMES,
   QUALITIES
40 GOSUB450 'INPUT QUALITIES
45 GOSUB500 'SORT, RANK, COMPARE
50 GOSUB600 'REPORT
55 GOSUB700 'DISPLAY
60 GOSUB900 'DO IT AGAIN?
65 END
70 '
100 'INITIALIZE
105 DIM TN$(20) 'TARGET NAMES
110 DIM R(20,10)'RATINGS
115 DIM IMP(10) 'IMPORTANCE
120 DIM CH$(10)'CHARACTERISTICS
125 NQ=10 'NUMBER OF QUALITIES
130 BL=453 'BOTTOM LINE
135 X=0:Y=0:F=0:T$=""
140 L1=163:L2=178:L3=176:L4=L3+9
4
145 RETURN
150 '
200 'COVER SCREEN
205 C=RND(8):IF C=4 THEN 205
210 GOSUB 710 'DRAW HEART
215 T1$="computer":T2$="cupid":T
3$="BY T. GRAY"
220 PRINT@128+32+16-(LEN(T1$)/2)
,T1$;
225 PRINT@224+16-LEN(T2$)/2,T2$;
230 PRINT@320+16-LEN(T3$)/2,T3$;
235 GOSUB 1055
240 RETURN
241 '
300 'INPUT PERSONAL DATA
305 CLS
310 PRINT:PRINT"HI, WHAT'S YOUR
```

Supplemental Income Schedule
Capital Gains and Losses
Profit or (Loss) From Business or Profession
Depreciation and Amortization
Schedule A—Itemized Deductions
1040 U.S. Individual Income Tax Return 1984
1984
ENTER
SHIFT
CLEAR

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Signature __________

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PROGRAM FEATURES

Designed by a 15-year tax consultant, the program has built-in tax tables and tax rate schedules and supports the following forms:

1040
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MORE FEATURES

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- Calculator mode supports +, −, *, /, = on numeric data.
- Edit capability: any line at any time. Supports change, delete, hack, search, and insert commands.
- Full on-line diagnostics to check input data.
- Runs on 32K extended Basic (one disk drive with change of diskette during program execution) or two disk drives. Comes with diskettes and operating manual that describes each screen presentation. Additional forms and overlays are available by special order.
- Full disk drive storage for all data and computations.
- Its combination of machine language and Basic is fast and it minimizes memory use.

Improvement over last years version

- Depreciation overflow to 20 items on Sch. C
- Program executes 3 times faster
- Program determines forms for printing

New Mini version

- Supports only 1040, 1040A, schedules A, B and W

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```
NAME?"
315 INPUT UN$
320 PRINT"OKAY, ";UN$","
325 PRINT"ENTER <G> IF YOU'RE A
GIRL"
330 PRINT"ENTER <B> IF YOU'RE A
BOY"
335 INPUT US$:IF LEFT$(US$,1)<>"
G" AND LEFT$(US$,1)<>"B"THENGOTO
325
340 GOSUB980:GOSUB1055
345 '
350 CLS:PRINT:PRINT"NOW IT'S TIM
E TO FIND OUT WHAT"
355 PRINT"YOU LOOK FOR IN A "TS$
"."
360 PRINT"YOU WILL HAVE TO RATE
EACH":PRINT"QUALITY I SHOW YOU":
PRINT"ON A SCALE FROM 1 TO 10.":
PRINT:PRINT"1 MEANS YOU DON'T MU
CH CARE":PRINT"IF THE "TS$" HAS
THAT QUALITY OR":PRINT"NOT.  A <
10> MEANS IT IS REALLY IMPORTANT
 TO YOU THAT THE "TS$
365 PRINT"HAS THAT QUALITY.":GOS
UB1055
370 CLS:PRINT:T$="YOUR IDEAL "+T
S$:F=1
375 GOSUB 925 ' DISPLAY QUALITIE
S
380 GOSUB1080:RETURN
385 IFF=1 THEN IMP(Y)=N:RETURN
390 IF F=2 THEN R(X,Y)=N:RETURN
395 RETURN
400 'INPUT NAMES, QUALITIES
405 CLS:PRINT
410 PRINT"NOW IT IS TIME TO ENTE
R THE":PRINT"NAMES OF SOME "TS$"
S YOU ARE":PRINT"INTERESTED IN."
415 PRINT:PRINT"RATE EACH "TS$:P
RINT" ON A SCALE OF 1 TO 10":PRI
NT"FOR EACH QUALITY.":PRINT"A <1
> MEANS THE "TS$" IS LOW"
420 PRINT"ON THAT QUALITY, WHILE
 A":PRINT"<10> MEANS THE "TS$" H
AS A LOT":PRINT"OF THAT QUALITY.
  BE HONEST,":PRINT"FAIR, AND OB
JECTIVE."
425 GOSUB 1055
430 CLS:PRINT"ENTER THE NAME OF
EACH "TS$:PRINT"YOU ARE INTEREST
ED IN.":PRINT"PRESS <ENTER> AFTE
R EACH NAME.":PRINT"PRESS <ENTER
> AGAIN WHEN YOU AREFINISHED.":X
=1
435 PRINT TS$" NUMBER "X
440 INPUT TN$(X)
445 IF TN$(X)=""ORTN$(X)=CHR$(13
) THEN NT=X-1:RETURNELSEX=X+1:GO
TO435
450 CLS:F=2:FORX = 1 TO NT:T$=TN
$(X)
455 GOSUB 925
460 NEXT X:F=0
465 RETURN
500 'SORT, RANK, COMPARE
505 CLS:PRINT:PRINT:PRINT"I'M CH
ECKING THESE "TS$"S OUT...."
510 FOR X=1TO NT
515 FOR Y=1 TO NQ
520 SCORE(X)=SCORE(X)+R(X,Y)*IMP
(Y)
525 SOUNDRND(100),RND(5):SOUNDRN
D(100),RND(5)
530 NEXTY,X
535 'RANK
540 W=1
545 FOR C= 2 TO NT
550 IF SCORE(C)>SCORE(W) THEN W=
C
555 NEXT C
560 CHOICE$=TN$(W)
565 GOSUB1055
570 RETURN
600 'REPORT CHOICE
605 S=3:GOSUB1165:PRINT"  ARE Y
OU READY FOR THIS?":GOSUB1055
```

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```
610 GOSUB1165:PRINT"   THE WINNE
R...":GOSUB1055
615 GOSUB1165:PRINT"   THE ONE W
HO COMES CLOSEST       TO MEETIN
G YOUR ":PRINT"     REQUIREMENTS
...":GOSUB1055
620 GOSUB1165:PRINT"  THE ";TS$;
" OF YOUR DREAMS... ";:GOSUB 105
5
625 GOSUB1165:PRINT"   IS....":G
OSUB1055
630 RETURN
700 RESTORE:GOSUB705:GOSUB735:RE
TURN
705 X$="":C=0
710 CLS(C)
715 READ X:READ Y:IF Y=255 THEN
RETURN
720 C=4:FLAG=32
725 SET(X,Y,C)
730 GOTO 715
735 K=L1:N$=UN$:GOSUB1225:PRINT@
L,N$;
740 PRINT@L3,"+";
745 K=L2:N$=CHOICE$:GOSUB1225:PR
INT@L,N$;:L2=L
750 PRINT@L4,"true";:PRINT@L4+64
,"love";
755 GOTO 805
760 DATA 1,9,1,10,1,11,1,12,2,7,
2,8,2,13,2,14,3,6,3,15,4,5,4,16
765 DATA 5,4,5,17,6,4,6,18,7,3,7
,18,8,3,8,19
770 DATA 9,2,9,20,10,2,10,20,11,
2,11,21,12,2,12,21,13,1,13,22,14
,1,14,23,15,1,15,23,16,1,16,24,1
7,1,17,24,18,1,18,25
775 DATA 19,1,19,25,20,1,20,26,2
1,1,21,26,22,1,22,27,23,2,23,27,
24,2,24,27,25,2,25,28,26,3,26,28
780 DATA 27,3,27,29,28,4,28,29,2
9,4,29,30,30,5,30,30,31,6,31,31
785 DATA 32,6,32,31,33,5,33,30,3
4,4,34,30,35,4,35,29,36,3,36,29,
37,3,37,28,38,2,38,28,39,2,39,27
,40,2,40,27,41,1,41,27
790 DATA 42,1,42,26,43,1,43,26,4
4,1,44,25,45,1,45,25,46,1,46,24,
47,1,47,24,48,1,48,23,49,1,49,23
,50,1,50,22
795 DATA 51,2,51,21,51,22,52,2,5
2,21,53,2,53,20,54,2,54,20,55,3,
55,19,56,3,56,18,57,4,57,18,58,4
,58,17,59,5,59,16,60,6,60,15,61,
7,61,8,61,13,61,14,62,9,62,10,62
,11,62,12
800 DATA 255,255
805 X$=INKEY$:PRINT@L2,CHOICE$;:
GOSUB1195
810 X$=INKEY$:PRINT@L2,CHOICE$;:
IF X$=""THEN 805 ELSE RETURN
815 RETURN
900 'DO IT AGAIN OR QUIT
905 CLS:PRINT:PRINT"WANT TO TRY
AGAIN?"
910 INPUT ANS$
915 IF LEFT$(ANS$,1)="Y"THEN RUN
ELSE RETURN
920 RETURN
925 'PRINT QUALITIES
930 CLS:PRINT"RATE "T$:PRINT"ON
EACH QUALITY:":PRINT
935 FOR Y=1 TO NQ
940 PRINTTAB(0)CH$(Y)TAB(27)"";
945 GOSUB960:GOSUB385
950 NEXT Y
955 GOSUB1080:RETURN
960 'INPUT RATING, 0 TO 10
965 INPUT N
970 IF N<1 OR N>10 OR N<>INT(N)T
HEN PRINT"ENTER A NUMBER FROM 1
TO 10":GOTO 965
975 RETURN
980 'SET UP STRINGS, CHARACTERIS
TICS
985 IF LEFT$(US$,1)="G" THENGOSU
B1025:RETURN
```

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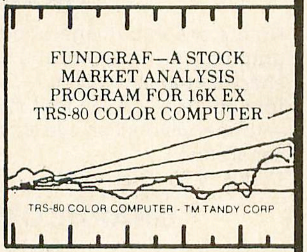

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—Scott L. Norman, HOT COCO

```
990 SBJ$="SHE":OBJ$="HER":PS$="H
ER":TS$="GIRL"
995 CH$(1)="PRETTY FACE":CH$(2)=
"WELL-BUILT":CH$(3)="INTELLIGENT
":CH$(4)="SEXY/PASSIONATE"
1000 CH$(5)="THOUGHTFUL AND CONS
IDERATE":CH$(6)="WARM AND LOVING
"
1005 CH$(6)="SENSE OF HUMOUR":CH
$(7)="DELICATE AND FEMININE":CH$
(8)="THE RIGHT HEIGHT"
1010 CH$(9)="RICH":CH$(10)="ATHL
ETIC/LIKES SPORTS"
1015 RETURN
1020 '
1025 SBJ$="HE":OBJ$="HIM":PS$="H
IS":TS$="GUY"
1030 CH$(1)="HANDSOME":CH$(2)="M
USCULAR":CH$(3)="INTELLIGENT"
1035 CH$(4)="SEXY AND PASSIONATE
":CH$(5)="THOUGHTFUL AND CONSIDE
RATE":CH$(6)="HAS A CAR"
1040 CH$(7)="TOUGH AND MACHO":CH
$(8)="THE RIGHT HEIGHT"
1045 CH$(9)="SENSE OF HUMOUR":CH
$(10)="WELL-GROOMED"
1050 RETURN
1055 'WAIT FOR USER
1060 W$="PRESS ANY KEY TO GO ON"
1065 PRINT@BL,W$;
1070 EXEC44539
1075 RETURN
1080 'CHECK FOR TOO MANY TENS
1085 SUM=0
1090 FOR P=1 TO NQ
1095 IFF=1THENSUM=SUM+IMP(P)ELSE
IFF=2THENSUM=SUM+R(X,P)
1100 NEXT P
1105 IF SUM>(NQ-1)*10 THEN GOSUB
1110ELSE IF SUM <15 THEN GOSUB 1
130 ELSE  RETURN:RETURN
1110 CLS:SOUND10,5:SOUND1,10:PRI
NT:PRINT"COME OFF IT!"
1115 PRINT:PRINT"NO "TS$" IS THA
T PERFECT!"
1120 PRINT:PRINT"BE A LITTLE MOR
E realistic      THE NEXT TIME Y
OU PLAY!":GOSUB1055:IF SUM=100AN
D TS$="GIRL"THENGOSUB1150:GOSUB1
055
1125 RUN
1130 CLS:SOUND 100,5:SOUND 200,5
1135 PRINT:PRINT"YOU'RE SURE NOT
 FUSSY!":PRINT:PRINT"JUST SO THE
 "TS$" IS ALIVE":PRINT"AND MOVIN
G, RIGHT?"
1140 GOSUB 1055:RUN
1145 'SUBROUTINE FOR PERFECT 10
1150 FORC=0TO8:CLS(C):FORW=1TO50
:NEXTW,C
1155 CLS:PRINT@32*3,"IF THE WOMA
N really IS ":PRINT@32*5,"     **
*** A perfect 10 *****     ":PRIN
T:PRINT:PRINT"   THEN CALL MR. P
ROST!"
1160 'SCREEN ADVANCE FOR TEASER
1165 CLS
1170 FOR X=1 TO S
1175 : PRINT
1180 NEXT
1185 S=S+1
1190 RETURN
1195 'FLASH NAME
1200 FOR X=1 TO LEN(CHOICE$)
1205 : MID$(CHOICE$,X,1)= CHR$(A
SC(MID$(CHOICE$,X,1))+FLAG)
1210 NEXT
1215 FLAG=-(FLAG)
1220 RETURN
1225 'CENTRE NAMES
1230 L=INT(K+(12-LEN(N$))/2)
1235 RETURN
1240 FOR S = 1 TO 2
1245 MOTORON
1250 FORX=1TO8000:NEXT
1255 CSAVE "CUPID"
1260 NEXT S
```

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GAMEMASTER'S APPRENTICE

Use Imagination And Creativity With Role Playing Games

By George Firedrake and Karl Albrecht

Farewell Art, Hello Karl

Our pages in THE RAINBOW are too few for all we want to do, so we reluctantly drop the development of *Taipan: A Game in Context*. Art Canfil has finished writing the CoCo version of the book and is now working on Apple and Commodore paraphrases. We'll let you know when the CoCo book is published.

As you may know, George Firedrake is also known as Bob Albrecht. He and Karl Albrecht have played together for all of Karl's life. When Karl was three, they decided Bob would do the easy stuff and Karl would handle more difficult things. This relationship has worked especially well in the world of computers and fantasy role playing games. Karl is now 16 years old — Bob is somewhat older. No one knows how old George is.

> *"A character is any imaginary person or other creature created according to the rules of a game system . . . We encourage you to design your own team and send them into the labyrinth."*

We just received a letter from Rick Loomis, the originator of play-by-mail games. He tells us many of you have sent for *Heroic Fantasy* rules. The more players, the more fun we will have sharing our experiences on these pages!

Into the Labyrinth

We have signed up for *Heroic Fantasy* and sent our first team of Adventurers into the labyrinth. Here they are:

Name	Sex	Code	Kindred	Class*	Potion**	Str	Con	Cost
Ai Khong	M	H	Hobbit	F	H	5	15	5
Frona	F	H	Hobbit	F	H	5	15	5
Mariko	F	H	Hobbit	M	H	4	15	7
Steffi	F	H	Hobbit	M	H	4	15	7
Sheri	F	P	Human	F	H	15	30	9
Zamora	M	P	Human	M	H	10	30	11
Tindil	M	E	Elf	F	H	25	25	15
Leiko	F	E	Elf	M	H	20	25	18
Jonjari	M	D	Dwarf	F	H	30	40	23
TOTALS						118	210	100

*CLASS: F = Fighter, M = Magic-User

**Each character can carry one magic potion into the labyrinth: H = Healing, S = Strength. We decided to send a healing potion with every character — we want to keep them alive as long as possible!

We'll play two turns a month. We hope to have at least one turn to report to you next time.

Design Your Own Team

We encourage you to design your own team and send them into the labyrinth. Begin by getting the rules for *Heroic Fantasy*. Send $1 to Flying Buffalo, Inc., Dept. GMA, P.O. Box 1467, Scottsdale, AZ 85252-1467. Be sure to tell them you want the rules for *Heroic Fantasy* — they have several other play-by-mail games.

Last time, we set up a database containing the character type information and showed you two programs to use the information: Scan Character Types and Compute Cost Ratios. This time, we begin developing a simple worksheet program, and challenge *you* to complete it. We'll show you our program (or programs) next time.

Our first worksheet program is simple. With this program, you can design a team having up to 13 characters.

All information is on the screen all the time. When you type *RUN*, this is what you first see:

```
C#  CODE   CLASS        STR  CON   COST
 1                        0    0      0
 2                        0    0      0
 3                        0    0      0
 4                        0    0      0
 5                        0    0      0
 6                        0    0      0
 7                        0    0      0
 8                        0    0      0
 9                        0    0      0
10                        0    0      0
11                        0    0      0
12                        0    0      0
13                        0    0      0
TOTALS:                   0    0      0
CHARACTER #? ■
```

Yes, we are feeling the pinch of a 16-line screen! Since we want to keep all information about our characters on the screen, we limit the number of characters to 13. We'll use the bottom line of the screen to get information and rewrite the screen anytime incoming information might cause scrolling.

Well, let's start with character #1. We type the number '1' and press ENTER. The screen remains the same except the bottom line which now asks:

```
CODE? ■
```

You see this on the bottom line of the screen.

The CoCo will accept any valid KINDRED code with a single keypress (use *INKEY$* to get it). Valid codes are:

CODE	KINDRED
F	Fairy
G	Gremlin
L	Leprechaun
H	Hobbit
K	Goblin
P	Human
E	Elf
D	Dwarf
O	Ogre
T	Troll
X	Giant

Ever-patient CoCo will wait until you press a valid code key. Let's type 'P' for human. The screen now looks like this.

```
C# CODE  CLASS     STR CON  COST
 1  P                0   0     0
 2                   0   0     0
 .                   0   0     0
 .                   0   0     0
 .                   0   0     0
13                   0   0     0
TOTALS:              0   0     0
CHARACTER #? ■
```

This line changes.

This line changes.

On the bottom line, the CoCo is now asking for the class of the character.

Valid answers are 'F' for fighter or 'M' for magic-user. Let's make our human a magic-user. We press the 'M' key and see:

```
C#  CODE  CLASS       STR  CON   COST
 1   P     M           10   30     11
 2                      0    0      0
 3                      0    0      0
 4                      0    0      0
 5                      0    0      0
 6                      0    0      0
 7                      0    0      0
 8                      0    0      0
 9                      0    0      0
10                      0    0      0
11                      0    0      0
12                      0    0      0
13                      0    0      0
TOTALS:                10   30     11
CHARACTER #? ■
```

Our first character!

Our team now has one member, a human magic-user. We have spent a total of 11 points. Let's add character #2, who is an elf fighter.

Type '2' and press ENTER.
Press the 'E' key.
Press the 'F' key.

Now the screen looks like this.

```
C#  CODE  CLASS       STR  CON   COST
 1   P     M           10   30     11
 2   E     F           25   25     15
 3                      0    0      0
 4                      0    0      0
 5                      0    0      0
 6                      0    0      0
 7                      0    0      0
 8                      0    0      0
 9                      0    0      0
10                      0    0      0
11                      0    0      0
12                      0    0      0
13                      0    0      0
TOTALS:                35   55     26
CHARACTER #? ■
```

And so on until we have the team we want with a total cost not to exceed 100.

1) How can you change a character? For example, can you now change character #1 to a human fighter or a hobbit magic-user?
2) How can you remove a character? Look again at the database from last time. What do you see in Line 32180?
3) How do you get the numbers on the screen to line up as shown above?

In the next time or two or three, we will show more than one way to write this program. Our first program will use the following subroutine to set up a string array to hold character type information.

```
15000 REM**CHAR TYPE ARRAY SUBR
15005 REM**CODE$CLASS$STRCONCOST
15010  CT$(1)    = "FF   1   1    1"
15020  CT$(2)    = "FM   1   1    2"
15030  CT$(3)    = "GF   3   4    3"
15040  CT$(4)    = "LM   3   4    4"
15050  CT$(5)    = "HF   5  15    5"
15060  CT$(6)    = "HM   4  15    7"
15070  CT$(7)    = "KF   7  20    6"
15080  CT$(8)    = "PF  15  30    9"
15090  CT$(9)    = "PM  10  30   11"
15100 CT$(10)    = "EF  25  25   15"
15110 CT$(11)    = "EM  20  25   18"
15120 CT$(12)    = "DF  30  40   23"
15130 CT$(13)    = "DM  30  40   36"
15140 CT$(14)    = "OF  35  40   29"
15150 CT$(15)    = "OM  35  40   46"
15160 CT$(16)    = "TF  50  50   57"
15170 CT$(17)    = "XF  60  60   72"
15180 CT$(18)    = "ZZ   0   0    0"
15190 RETURN
```

The array CT$ contains the information for the 17 character types plus CT$(18), which marks the end of the array. For example, CT$(11) is the information for an elf magic-user.

CT$(11)="EM 20 25 18"

CODE CLASS STR CON COST

Each string in the array is 11 characters long and contains five items of information, positioned within the string as follows.

Position(s)	Item
1	Kindred Code
2	Class
4&5	STR
7&8	CON
10&11	COST

Positions 3, 6 and 9 are spaces included to make the string more readable by humans. We could have omitted these and packed the information as follows.

"EM202518"

Plunge right in and write the program. Later, think about other ways to set up the CT$ array. How can you define the CT$ array using the database from last time (*DATA* statements in lines 32010 through 32180)? For example, the information for CT$(11) is in Line 32110.

32110 DATA E,ELF,M,20,25,18

"EM 20 25 18"

Hint: Use the STR$ function.

Who is a Character?

A character is any imaginary person or other creature created according to the rules of a game system. The characters in *Heroic Fantasy* are quite simple. The characters in *Dungeons & Dragons* or *RuneQuest* are much more detailed and complex. Characters in *Adventurer's Handbook* are simplified versions of characters found in the very elegant *RuneQuest* system.

In past issues, you met Aloysious and Rokana. Here they are again, accompanied by two friends, Dernfara and Joleen. We show partial character records for all four characters.

	Aloysious	Rokana	Dernfara	Joleen
Characteristics				
STR	10	9	13	13
CON	11	9	13	11
SIZ	10	9	8	7
INT	12	17	13	13
POW	10	18	4	8
DEX	12	9	17	17
CHA	9	10	6	13
Skills				
Climb	55	65	70	70
First Aid	50	60	50	45
Hide	55	60	75	80
Jump	45	55	60	60
Listen	50	60	50	45
Move Quietly	25	30	45	50
Spot Hidden	30	40	30	25
Swim	20	30	35	35
Throw	45	55	60	60

In many activities, a character has less than a 100 percent chance of success, sometimes *much* less. The numbers across from Skills such as Climb, First Aid and Hide are success percentages. Let's take Jump as an example.

Yes, we know almost anyone can jump. In this case, Aloysious has a 45 percent chance to jump:

1) Across a ditch about four meters wide, or
2) up, up, and over something one meter high, or
3) down from a place four meters high without falling and possibly getting hurt.

If he fails, he falls into the ditch (we hope it is shallow), trips over the something and falls on his face, or lands in a heap while jumping down. He might get hurt doing this and take a few hit points.

In typical game play, success or failure is determined by making a percentile roll using 10-sided dice, giving a random number from 0 to 99. OK, Aloysious, jump that ditch!

Success: Roll 45 or less.

Failure: Roll 46 or more.

A roll of zero is special. It is called a fumble. The GM will prescribe a suitable disaster.

Aloysious is meandering down a path through the forest. He comes to a somewhat deep and fast-moving stream about eight meters wide. There is a large rock showing in the middle of the stream. Aloysious doesn't feel like trying to swim across, so he tries to jump to the rock. He figures he can cross the stream in two jumps.

Roll the dice: zero. Oops! That's a fumble. Aloysious' foot hits the rock and slips off. He bangs his knee, scrapes his arm, bounces his chin off the rock, and plunges into the cold, rushing water.

The GameMaster solemnly intones "1D6 hit points." We roll 1D6 and get three. His clothing absorbs one point, so we mark off two hit points on his character sheet.

You will find information about GameMaster's Dice in the April, June and August 1983, "GameMaster's Apprentice" articles, including programs to simulate dice rolls on the CoCo.

Rokana, Dernfara and Joleen have higher Jump percentages than does Aloysious. Let's see what happens when the four of them go to the spring festival in Triford.

Early on a spring day, the festival begins — food, drink, music, dancing, contests of skill and luck abound. Our characters arrived at dawn and have already spent two wondrous hours savoring the festival's delights. Now, with some misgivings, they approach the Mud Ditch.

The Mud Ditch is four meters wide and one meter deep. It is filled with gooey mud. In the town of Triford and surrounding villages, it is a matter of honor for youngsters to try the Mud Ditch at festival time.

Joleen, always the most daring, goes first. She tenses, runs toward the ditch, springs, soars, and . . . we make a percentile roll: 57. Joleen's success percentage is 60. She made it!

Reluctantly, Aloysious lines up, urged on by his friends. "Come on, Aloysious, you can do it!" Aloysious sprints toward the ditch and, with a mighty grunt, heaves himself into the air. We roll 38. Alas, Aloysious takes a mud bath.

Now it's your turn. Do Rokana and Dernfara leap successfully across the mud ditch, or does one or the other suffer the fate of Aloysious? You roll the dice or use the CoCo to find out.

	Success	**Failure**
Rokana	55 or less	56 or more
Dernfara	60 or less	61 or more

Want to Play Our Game?

Do any of you want us to run a small play-by-mail game? In this game, you would run one character like Aloysious or Rokana. You take your character to a festival. Today they are called "Renaissance Faires," but in the world of Aloysious and Rokana they were contemporary fairs.

No previous experience is needed to play our play-by-mail game. Your only costs will be a copy of *Adventurer's Handbook* and some self-addressed, stamped envelopes. If you want to play, send a SASE to DragonFun, P.O. Box 310, Menlo Park, CA 94026. (Our games are rated G, intended as an enjoyable family experience. We encourage non-violence and cooperation.)

ROLE PLAYING GAMES

Millions of people play fantasy role playing games. A role playing game is a game in which one or more players create and play characters (adventurers) who live their imaginary lives in a specially made game world. The game world is created, managed, and operated by a GameMaster (GM), referee, or dungeon master (DM).

Most people who play role playing games use a formal rule system. Some of the best known are shown below.

Champions. *Hero Games, 92A 21st Avenue, San Mateo, CA 94402.*

Dungeons & Dragons (D&D). *TSR, P.O. Box 756, Lake Geneva, WI 53147.*

RuneQuest (RQ). *Avalon Hill, 4517 Harford Road, Baltimore, MD 21214.*

Star Trek. *FASA, P.O. Box 6930, Chicago, IL 60680.*

Tunnels & Trolls (T&T). *Blade, P.O. Box 1467, Scottsdale, AZ 85252.*

Beginners beware! The rule books are formidable. If you are a beginner, we suggest you start with one of the following books, both from Reston Publishing Company, 1480 Sunset Hills Road, Reston, VA 22090.

Adventurer's Handbook: A Guide to Role Playing Games *by Bob Albrecht & Greg Stafford.*

Through Dungeons Deep *by Robert Plamondon.*

In "GameMaster's Apprentice," we include how-to-play information for all beginners.

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Submitting Material To The Rainbow

Contributions to THE RAINBOW are welcome from everyone. We like to run a variety of programs which will be useful/helpful/fun for other CoCo owners.

Program submissions must be on tape or disk and it is best to make several saves, at least one of them in ASCII format. We're sorry, but we do not have time to key in programs. All programs should be supported by some editorial commentary, explaining how the program works. We're much more interested in how your submission works and runs than how you developed it. Programs should be learning experiences.

We do pay for submissions, based on a number of criteria. Those wishing remuneration should *so state* when making submissions.

For the benefit of those who wish more detailed information on making submissions, please send a SASE to: Submissions Editor, THE RAINBOW, P.O. Box 385, Prospect, KY 40059. We will send you some more comprehensive guidelines.

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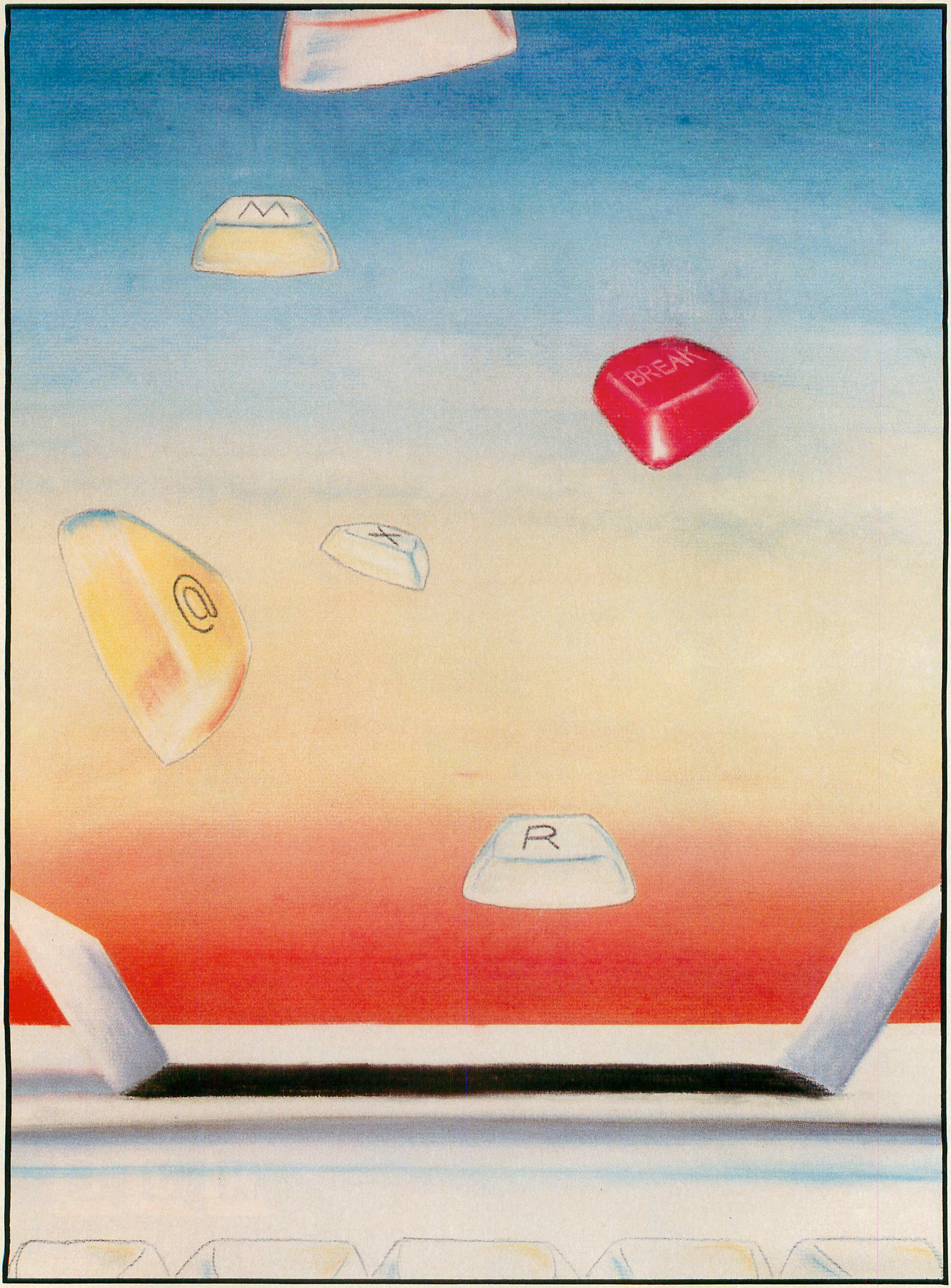
M
BREAK
@
R

Enhance Your Keyboard Input With Buffer Stuffer

By Richard W. Rutter

This program consists of a position independent machine language routine designed to greatly enhance your Color Computer's keyboard input capability. Its features include:

1) The ability to mask (disable) up to 10 keys.
2) The ability to unmask any key that had been previously masked.
3) The ability to increase or decrease the size of the input text buffer.
4) A resetable right tab key.
5) A resetable left tab key.
6) A repeat key to allow rapid duplication of any printable keypress, and the ability to either increase or decrease the speed of this repeat function.
7) An exchange function that lets you change characters anywhere within the input buffer instead of having to retype the line.
8) The ability to edit BASIC text strings using any or all of the above options.
9) The ability to apply any or all of the above options to Extended Color BASIC's line statement *EDIT* function.
10) The ability to enable or disable the entire program, as needed, by entering the command *EXEC*.

In essence, *Buffer Stuffer* provides the capability to both input and edit command lines and program statements and text strings according to user modifiable specifications.

(Richard Rutter works for a design and development company which specializes in computer-controlled flexible manufacturing systems.)

The program will require 1,536 bytes of storage. It may be offset loaded into either an unused graphics page or behind the string pool. There are two ways to create the program: First, process the Assembly Language Source Code with a dependable assembler, or second, use the Object Code Generator to poke the instructions into RAM and have a complete block of memory saved on either cassette or disk.

If you have a 16K computer, you may need to *PCLEAR 3* to provide room for the Object Code Generator. Also, you should exclude the comments in the Source Code to assure that it will fit within a 16K computer. A detailed description of how these programs function will be provided later.

Remember that the assembler generated version will always need a loading offset value, but the OCG version may not necessarily require one. Here are two loading examples: *CLOADM "BUFBIN",1536* for Extended Color BASIC or *LOADM "BUF.BIN",3541* for Disk Extended Color BASIC.

After you have loaded it into your computer, enter the command *EXEC*. The program is now "patched" into your computer's line input routine. To verify this, press the down-arrow key. This key is the control key. When you press it, the cursor will flash yellow, reminding you you're in the control mode. Whenever in this mode, you will have nine keyboard command options available. You may abort the control mode by again pressing the control key. Let's look at each of the nine control mode options.

If not already in the control mode, press the control key to activate it. Now press

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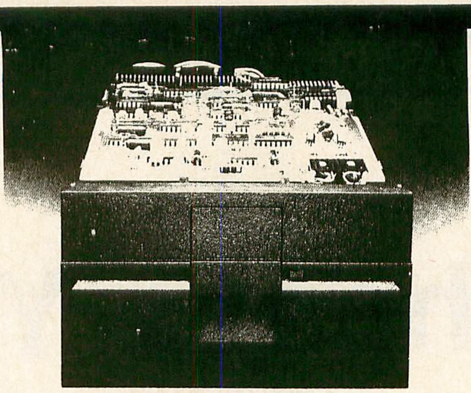

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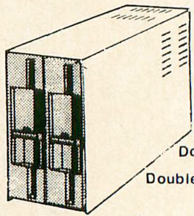

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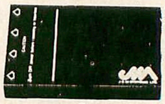

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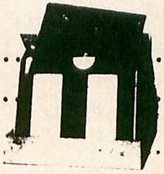

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right-arrow key. You have just sent a right tab. The value of the right tab has been initially set to five blank spaces.

To reset the right tab, press the control key and then press 'R'. You will see the prompt RTAB:. Enter the desired numerical value. Note that only three-digit key presses will be accepted; anything beyond that will be ignored. Non-digit key presses will not be displayed.

If you key in the wrong value or change your mind for whatever reason, press BREAK and the routine will abort without affecting any current values. Take note that there is no backspace function. Use the BREAK option to start over if you should make a mistake. Press ENTER to return the current value. Note that an entry less than one will cause an automatic abort, and all values will remain unchanged. An entry in excess of 250 will be adjusted equal to 250. To verify all of this, experiment with both setting and sending the right tab.

The left tab is the opposite of the right tab. To send one, press control, and then press the left-arrow. The left tab erases a predetermined number of characters. To reset the left tab value, press control and then press 'L'. You will see the prompt LTAB:. Enter the desired value in precisely the same manner as you would set the right tab.

You may change the buffer size by pressing control and then pressing 'B'. The prompt BUF: will appear. Enter the desired buffer size, one to 250. The buffer size determines how many characters may be entered into the current line. It is difficult to overstate the usefulness of this option.

Now let's try masking a key. Press control, then press 'M'. You see the prompt MASK:. Press whatever key you wish to mask. To verify that the key is masked, try pressing it; any key that is masked will be completely ignored. The main purpose of the mask option is to prevent the loss of data from an accidental key press. You will almost certainly want to mask the BREAK and CLEAR keys. Also, the "line erase" SHIFT-left arrow and ENTER keys are prime candidates for masking.

It is fitting that an unmask option be available. Press the control key, and then press 'U' and you will see the prompt UNMASK:. Press whatever key you wish to unmask. To verify that it is unmasked, press it. You normally would not press keys such as BREAK, ENTER, and CLEAR to test for mask status, for obvious reasons. Also, note that two keys are not completely maskable. If you mask the control key, it will still allow access to one control option, the unmask function. If you mask the 'U' key, it will still respond to an unmask request.

Another feature is the repeat key option. To try it out, press any printable key and press SHIFT-@. The current character will begin to duplicate itself and will continue to do so until you press a key to stop it, or either the beginning or end of the buffer is reached. You may also use the repeat key to repeat delete (left-arrow, SHIFT @).

It is a good idea to use the repeat key to stop and start the repeat process so you will be able to interact with it more swiftly. Practice using the repeat key to familiarize yourself with it.

The speed of the repeat process may be increased or decreased. Press control, then press 'S'. You see the prompt SPEED:. Enter the desired value from one to 250. A setting of one will give you the fastest speed, while a setting

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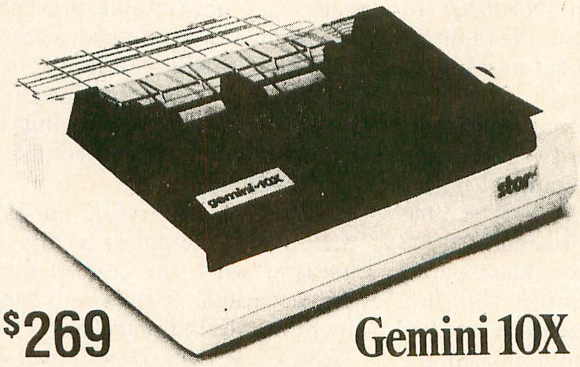

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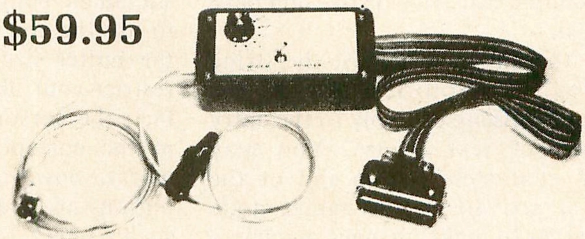

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of 250 will yield the slowest.

Perhaps the most useful feature is the EXCHANGE command. If at least one character is currently in the buffer, you may activate this mode by pressing control and then pressing 'X'. The cursor is now riding over the last character in the buffer. The cursor is flashing orange, and you will notice the character beneath it can still be seen.

When in the exchange mode, you have six commands available. They are: move left, move right, character delete, character insert, repeat function, and exit using ENTER. To move the cursor to the left, press the left-arrow. To move the cursor to the right, press the right-arrow. To delete the character directly under the cursor, press CLEAR. To insert a printable character, press the desired key, and it will be inserted at the current cursor position. To leave the exchange mode, press ENTER.

The only key checked for mask status in the exchange mode is the repeat key. If you want the repeat option to function, you should unmask it before entering this mode since no control options are available from within exchange. The repeat key is quite useful to quickly position the cursor anywhere within the buffer. Remember that you may enter and exit the exchange mode as needed so as to access the control options. Try experimenting with the exchange mode.

Yet another option is the ability to edit string variables. To use the option you will need Extended Color BASIC and a BASIC program subroutine similar to the sample edit driver program I have provided.

Run this program to test the string entry/edit capabilities. All of the commands discussed apply to the entry and edit of text strings. You may append characters to the end of the string or activate the exchange mode (control X) to make changes anywhere within the string. Press ENTER or BREAK to end the edit session. When you do, you see the prompt A/C/G:.

If you press 'A', the edit session will start again using the same string you originally sought to edit. If you press 'G', the current string will be sent directly into the BASIC variable, and control will return to the calling program. Pressing 'C', or any other key, will continue the edit session using the current string.

The final option available is the ability to edit program statements. If you have Extended Color BASIC, you should first use the *EDIT* command (i.e., *EDIT 30*) to access the desired line statement. All of BASIC's line *EDIT* commands are preserved (unless you choose to mask them). *Buffer Stuffer's* commands will also function (unless you choose to mask them). The ability to activate the exchange mode (control X) effectively provides an "editor within an editor." You may prefer the exchange mode when editing your BASIC programs.

There are a few changes to the performance of BASIC's *EDIT* function you should be aware of. The first is the possible effects when using the repeat option to repeat change characters. Since the repeat mode does not know how many changes to make, the key value causing the character change will be sent to BASIC immediately after the specified number of changes have been made, unless you have pressed a key to stop it. You will find it nearly impossible to react that quickly. A problem will occur if the keys 'A', 'E', 'Q', or 'X' are being repeat changed. They are also *EDIT* command keys, and if sent to BASIC could cause needless inconvenience.

If you have any problems with the repeat key when in line *EDIT*, you might consider masking the repeat key or activating the exchange mode. Realistically, this should rarely be a problem since you are unlikely to need a repeat change when editing a program statement.

Notice that if the current buffer limit is less than the length of the program statement being edited, you will need to use the control B option to expand the buffer size. Failure to do so will restrict your ability to edit the line. In fact, the cursor may even be "frozen" at the current position. No need to worry, however, because the control options are available to get you out of such a jam.

When you are in the character insert mode, you will be allowed to insert one character more than the current buffer limit. However, you will not be able to exit the insert mode (using SHIFT^ or ENTER) until you have backspaced at least one position to ensure your line is of legal length. This feature ensures your program lines cannot exceed the buffer size you have preset.

There is a modification to the keyboard that I have not yet mentioned. The right-arrow key now performs as an extra space bar. This simplifies the insertion and deletion of spaces. The right-arrow key does not function as a space bar when you are in the exchange mode; only when appending characters or when in normal line statement *EDIT* is it redefined.

The Assembly Language Source Code

All numerical values to the right of the line numbers are in base 10. Lines 90 to 220 equate ROM referenced memory locations which allow the program to communicate with BASIC on an interactive basis. We will demonstrate the functions of these equated locations as we encounter them throughout the source code.

Lines 260 to 450 define the prompt display strings; the end of each prompt is indicated by a *CHR$(255)*. Each of the control mode prompts starts with a *CHR$(128)*. This ensures that the prompts will not be confused with any other characters currently on the screen. All of these prompts will be erased automatically to prevent the display from becoming a jumbled mess.

Lines 490 to 910 contain the "variable" locations manipulated exclusively by the program. MAXBUF will reside in Location 51,PCR. Its value must never exceed 250, but it may be smaller. It determines just how large the buffer limit may become when using the set buffer control option.

BUFLIM will reside in Location 52,PCR. Its value determines the number of characters that may be entered into the current buffer. The buffer set routine is used to change it to any value between one and MAXBUF. It must never exceed 250.

CONKEY will reside in Location 53,PCR. It is used to define the control key. You may change it to any key you so desire. I chose the down-arrow key because it is unprintable, preventing the loss of any important characters.

REPKEY will reside in Location 54,PCR. It is used to define the repeat key. You may change it, but I chose the SHIFT @ key because it is unprintable.

CONCUR will reside in Location 55,PCR. It determines the cursor character when the control mode has been activated. It may be changed to any printable character.

EXCCUR will reside in Location 56,PCR. It determines the cursor character when the exchange mode has been activated or when the repeat mode is duplicating characters.

LTBSIZ will reside in Location 57,PCR. It determines how many backspace characters will be sent when a left tab is requested.

RTBSIZ will reside in Location 58,PCR. It determines how many blank characters will be sent when a right tab is requested.

RSPEED will reside in Location 59,PCR. Its value determines how quickly or slowly the repeat function will duplicate characters. It may contain any value from one to 255. The smaller its value, the faster the repeat speed.

MINVAL will reside in Location 60,PCR. It determines the minimum value accepted when using any of the control key value set commands. You may reset it to any value between one and 250.

Lines 590 to 800 are to be manipulated exclusively by the program. You should not attempt to change them.

Lines 810 to 900 make up the keyboard mask table. If a key is masked, its value will reside in one of these 10 locations (83,PCR to 92,PCR). The mask and unmask control functions manipulate these bytes. You may also manipulate this table as long as you do not change location 93,PCR since it flags the table's end.

Lines 950 to 1040 effectively patch the program into BASIC's keyboard input routine. A check is made to see if the patch is already in effect. Locations 1533,PCR and 1534,PCR must both contain *CHR$(255)*, or the routine will be deactivated rather than activated. The activation sequence requires that the two-byte memory value at Location 363 be replaced with the program's starting address. The value is first placed in Location RETBAS,PCR so that it may be restored at the next *EXEC* command.

Lines 1080 to 1140 effectively deactivate the program by pulling the return address out of RETBAS,PCR and placing it back into Location 363. Two *CHR$(255)*s are put back into RET BAS,PCR to allow reactivation at the next *EXEC* command.

Lines 1180 to 1730 comprise the routine to access BASIC string variables. The length and location of the variable must be sent to this routine from BASIC. Register Y points to the location of the variable. Register X points to the start of BASIC's input buffer. If the length of the variable is greater than zero, each character of the string will be placed into the BASIC buffer and displayed on the screen. The length of the string is temporarily increased by one to satisfy a ROM input requirement. The ROM subroutine is called, and the BASIC string is treated as keyboard input.

When either the BREAK key or the ENTER key is pressed, the BASIC ROM will return control to this calling location. This allows the options of either continuing, sending the results to BASIC, or reediting the original string. Continuing the edit is accomplished by erasing the prompt and positioning the cursor at the end of the current string.

We must take into account any screen scroll caused by the prompt display and compensate for it if needed. To restart the edit using the original string we must erase the prompt, erase the current string, and pull the original out of the BASIC string by starting anew. To send the current string, we simply erase the prompt, send the string length, and copy the characters into the BASIC string, if any.

Lines 1770 to 1910 contain the primary keyboard scan routines. If not in the exchange mode and not in the repeat mode, the cursor is flashed in the same way that normal BASIC would do it. The ROM POLCAT key scan routine is used to seek a key press. If

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a key is pressed, we erase the cursor.

Lines 1950 to 1990 provide the ability to send special cursor characters when in the exchange or repeat key modes. VIDPOS contains the current video screen print location.

Lines 2030 to 2270 contain the repeat key activation routine. A check is made to see if the repeat key had been pressed and if the current key value is a valid one. If so, a timing loop is started to search for a request to stop the repeat through any other key press. If the timer expires without any key press, the current key is fetched from CURKEY and returned as the key press. If a key is pressed, a check is made to see if it is the repeat key. If it isn't, that key will be returned as the current value. If it is the repeat key, it is checked for masked status. If masked, it is rejected.

Otherwise, the entire process is repeated until either the timer expires and CURKEY is returned as the key press, or a key other than REPKEY is pressed, thereby deactivating the repeat function and returning a new value in CURKEY.

I prefer this repeat method over the kind which requires you hold down a particular key. There are three reasons for this preference: First, having to hold down any key is annoying; second, the problem that can be caused if keys such as BREAK and ENTER are held down too long; and third, the instantaneous response available through a defined repeat key as opposed to the annoying delay by the other method. There is merit in either method, and you may wish to create a repeat routine different from the one provided.

Lines 2320 to 2530 perform a multitude of functions. BASIC's input routine jumps to CHECK whenever BASIC requires keyboard input. The device number must be zero, or the entire operation is aborted, returning directly to BASIC. A check is made to see if the buffer pointer (register X) is either at the beginning or the end of the buffer. Such would be the case if 'X' is pointing to the same previous location, and the repeat function must then be deactivated by setting CURKEY to zero. The input/output buffer is cleared to satisfy a BASIC requirement. The exchange mode indication flag is also cleared.

The current video screen location is saved for later use. The number of characters currently in the buffer is saved in BUFCNT. Tests are also made to see if either the right or left tab counts need to be satisfied, in which case the appropriate tab routine will be executed. A key scan is started and will continue until either a key is pressed or the repeat mode causes CURKEY to be fetched as the current value. The cursor is erased. The key is checked for masked status. If not masked, it is processed normally. If masked, a check is made to see if it is the control key. If it is the control key, we allow it to be processed. Any other masked key press will be hidden from BASIC.

Lines 2570 to 2660 comprise the check for mask routine. Each byte in the mask table is examined until either we find a match or reach the table's end. Register B will contain the search result. If the zero flag is set, the key is not currently in the mask table.

Lines 2700 to 2840 effectively process the current key press. If it is the control key, then we activate the control mode. If the right-arrow key has been pressed, we convert it to a blank. We fetch the number of characters currently in the buffer and see if the buffer limit has been reached. If there is still room, we send the key to BASIC. If not, we check to see if Extended BASIC's Line Edit is in operation by testing for a character count versus a buffer count mismatch. If the counts are equal, we are not in a Line Edit. Otherwise, we will only accept a backspace to bring the edit count within range. If we are not in Line Edit and the buffer limit has been reached, we will only accept a key press which will not add to the buffer. Any unusable key press will be rejected by hiding the current key press from BASIC and assuring that that character cannot be repeat processed.

Lines 2880 to 3110 process a control key request. The control cursor is flashed according to the special cursor flash timing function. The key scan/flash sequence will continue until a key is pressed. After getting a key press, we will attempt to convert it to uppercase. If the 'U' key has been pressed, the unmask routine is called. Any other keypress is checked for masked status. If masked, we hide it. Next, we check the control key itself for masked status. If it is masked, we abort the control session.

Lines 3150 to 3490 look for a valid control mode request. Any key that does not correspond to one of the control mode options is hidden from BASIC.

Lines 3530 to 3620 either hide or send the key press, as appropriate. If the key press is not repeatable, then no option to repeat it will be allowed. We fetch the current buffer count and save the current buffer pointer. We return to BASIC in a manner that will prevent a redundant key scan.

Lines 3660 to 3790 effectively unmask the desired key press. A prompt is displayed and a key press is looked for. The key press is searched for in the mask table, and if found, will be removed from the table. After successful unmask or reaching the table end, the prompt is erased, and the key press is hidden from BASIC.

Lines 3830 to 4000 effectively mask the desired key press. A prompt is displayed and a key press is looked for. The mask table is searched to find the first free byte. If one is found, the key press is stored in that byte, and the unmask routine is entered to assure that no mask duplications are present. If the end of the table is reached before a free byte is found, the key press will not be masked.

Lines 4040 to 4090 attempt to set a new buffer limit by calling the *Get Number* routine. If the value returned is equal to the maximum, no adjustment is needed, otherwise we must increase it by one to compensate for BASIC's input requirements. The new value of BUFLIM is saved, and the key press is hidden from BASIC.

Lines 4130 to 4150 attempt to set a new left tab value. Lines 4190 to 4210 attempt to set a new right tab value. Lines 4250 to 4270 try to set a new repeat speed.

Lines 4310 to 4350 effectively set to zero those values used by the get number routine.

Lines 4390 to 4460 are used to send prompts to the screen. A count of the number of characters sent is kept in BKUCNT so the prompt may later be erased.

Lines 4500 to 4540 erase the number of characters specified in BKUCNT. This routine is normally used to erase prompts.

Lines 4580 to 4910 get and process numerical value set requests. The appropriate prompt is displayed. Numerical values are set to zero. The key press count is set to three, assuring that no more than three digits may be entered. A key scan is started, and continues until a usable key is pressed. If a digit is pressed, it is sent to the screen, the get number routine is called, and the digit count is updated.

If BREAK has been pressed, the routine is aborted by erasing the prompt, pulling the return location off of the stack and hiding the key press

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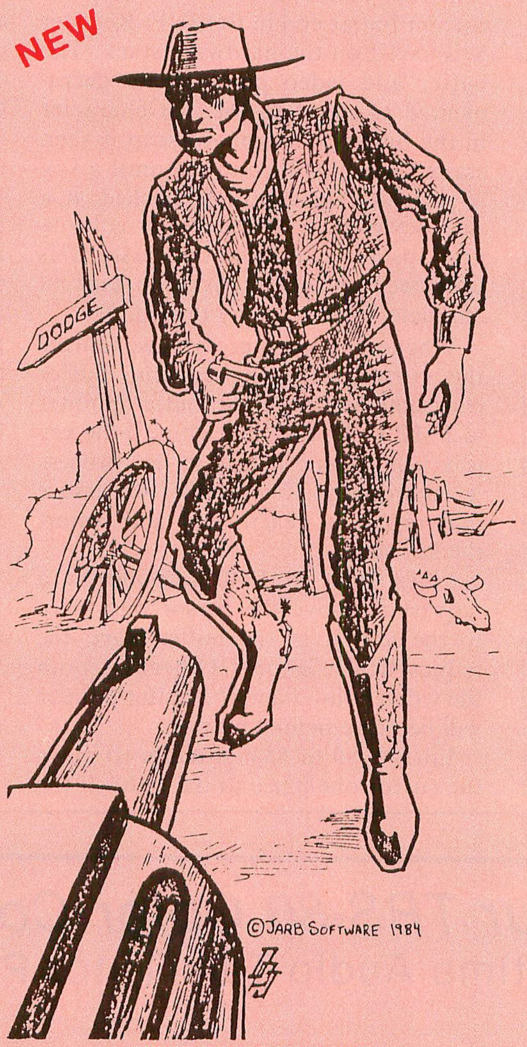

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from BASIC. If ENTER has been pressed, the prompt is erased, the number in CURVAL is tested for validity and is adjusted if too large, or the routine is aborted if the value is too small. Any usable numerical value (MINVAL to MAXBUF) will be returned to the calling routine.

Lines 4950 to 5230 figure an ongoing numerical quantity for the set value routine. The current digit is changed to a number and saved in register B. The decimal places will be moved from right to left, and a new value will be computed. Checks are made to see that no attempt will be made to compute a value greater than 255. If the value could exceed 255, it will be set equal to MAXBUF. Upon return from this routine, the current value (CURVAL) will be in register B.

Lines 5270 to 5640 attempt to activate and control the buffer exchange routine. The flag EXCHAN is incremented to indicate exchange mode activation. The current number of characters in the buffer are fetched. The current line end is flagged with a zero. The beginning of the buffer is tested to see if any characters are present; if none are, we abort the exchange request. If at least one character is present, we activate the exchange mode.

Upon activation, we save the current character count in BUFCNT and the current buffer end in EOBUF. Register Y is saved on the hardware stack. The buffer and video pointers are decremented to point to the last character in the buffer. A keyboard scan is then started which will continue until a key is pressed. The cursor is flashed at a rate determined by the *Timer* subroutine. Instead of erasing the cursor, this time we replace it with the current character pointed to by register X.

Whenever a key is pressed, we replace the cursor with the current buffer character and save the buffer pointer in TMPX. We then determine if the key is a usable one; if usable, we process it accordingly. If unusable, we assure that repeat is deactivated and restart the key scan.

Lines 5680 to 5740 respond to a request to move the cursor one place to the left. If at the buffer start, the request will be ignored. Otherwise, both the video pointer and the buffer pointer will be decremented by one.

Lines 5780 to 5840 attempt to move the cursor one place to the right. If the pointers are not current at the line end, they will be incremented by one to accomplish this.

Lines 5880 to 6260 attempt to insert a character at the current cursor position. The buffer count is fetched and checked to see if it is less than the buffer limit. If the count is equal, there is no room, and the request will be ignored.

Having determined that there is room, we set 'Y' to point to the current buffer end. We then move adjacent characters one place to the right until all characters from the current buffer position to the buffer end have been moved. We then insert the new character into the current buffer position. The buffer end is incremented and its value is cleared to indicate a new end of line. The characters on the screen are moved in a similar manner.

We must check to see if the screen will scroll by comparing the video position to the value of SCREND. If a scroll will occur, we must decrement the appropriate pointers by one full line. The new buffer contents from the buffer position rightward are displayed on the screen.

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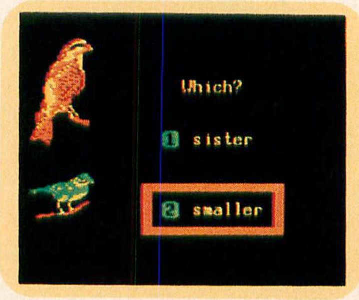
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moved, the current video position is replaced by the desired position. We also compensate for the additional character by incrementing the old video value, thereby providing the proper return screen location when the exchange mode is exited.

Finally, we increment the buffer pointer and buffer count, and return to the key scan routine.

Lines 6300 to 6600 will attempt to delete the character at the current cursor position. Two or more characters must be present for any to be deleted.

Deleting the character is accomplished by starting at the current buffer position and copying the character which is one position to the right of it into the buffer position. This continues until the end of the line is found, in which case a zero will be placed in the last character of the line.

We then test to see if the character just deleted was the last character of the line. If it was, we decrement the buffer and video pointers. In a manner similar to the one used by the insert function, the old screen characters are replaced by new ones. The last screen character is replaced with a blank.

Lastly, the video and buffer pointers are updated. The video position is reset to its proper place on the screen. The old video position is decremented so the proper return screen location is available when the exchange mode is exited. The end of buffer pointer is decremented to show the new end of buffer.

Lines 6640 to 6740 process the exit from the exchange mode. The video position is reset to one position beyond the last character on the screen. The original value of register Y is restored. The current buffer end is given to register X.

The exchange flag, EXCHAN, is decremented and tested for zero status. If equal to zero, Extended BASIC's Line Edit is not in effect, so the buffer counters must not be adjusted. If Line Edit is in effect, we must fetch and adjust the character count, give it to the edit count, and set the buffer operation count to zero. When in Line Edit, BUFCNT contains the operation count (i.e. the number of moves or changes requested). It should be set to zero upon exit of the exchange mode to assure the operation count will also be set to zero. The key press must also be hidden from BASIC.

Lines 6780 to 6810 pull a character from the current buffer position and send it to the current screen position.

Lines 6850 to 6930 effectively adjust register B for proper screen display.

Lines 6970 to 7000 are used to convert a key press command from lowercase to uppercase. This makes it simpler to check for keypress command matches.

Lines 7040 to 7170 are needed to determine the proper character count depending on which ROM has called *Buffer Stuffer*. We see if Line Edit is in effect by getting the calling address from the hardware stack. If the address is higher than the Line Edit Vector, we know we are not in Extended BASIC, and we simply return the normal buffer count.

If we are in Line Edit, the edit count is used as the character count. We next test the exchange flag to see if the exchange mode has been requested. If so, we call the ROM routine *Getend* to position the cursor at the end of the line. We then fetch the edit count, adjust it for the exchange mode and return it as the character count.

Lines 7210 to 7250 contain the timing routine used to determine when either the control cursor or the exchange mode cursor should be flashed.

Lines 7300 to 7320 contain the return location for normal keyboard input when the program is patched into BASIC or the proper flag to indicate that patching is needed if an *EXEC* command has been entered.

Line 7330 provides a convenient reference point for computing the actual length of the program. *Bottom* is also used as a counter in numerous locations throughout the program.

The Object Code Generator

The OCG is designed expressly for those who do not have an assembler. It contains the same instructions the assembler version would generate. Although essentially self-explanatory, some comments should be helpful.

If you have a disk system, do a *FILES 2,256* to assure that the data values will be poked into usable RAM. The OCG assumes you want a disk save for a disk system and a cassette save for a cassette system. To avoid this, change Line 190 to *DEV$="CASSETTE":GOTO 220.*

Note that if you have a 16K computer, you will need to *PCLEAR* three or fewer graphics pages to assure that the OCG will fit into your computer. Also, if you do not have Extended BASIC, you will need to reserve space behind the string pool and change the values of

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FI,LA and EX so they will reference that reserved memory. Here is one way to do it: Change Line 40 to *CLEAR 500,31100* and add the line *75 FI =31100:LA=FI+1535: EX=FI+94*

The String Edit Driver Program

For those of you who have Extended Color BASIC, this program allows you to edit string variables. It is fairly simple, but a few comments should be helpful.

Line 50 contains the execution offset. Some execution offset will always be required. Just what it should be depends on where in memory the 6809 routine currently resides. OF must be equal to whatever loading offset you used. For an OCG version, OF must be equal to FI plus any loading offset. Figuring the proper offset should be quite simple.

Line *10000* contains the essential ingredients of the parameter passing subroutine. EL is the memory location that contains BASIC's machine language execution address. We save this two-byte value by copying it into EA and EB. VP will contain the variable pointer of the parameter string PA$. VL will contain the address inside *Buffer Stuffer* where the location of the BASIC string will be stored.

We extract the true length of PA$. Next we pad PA$ with trailing blanks. VP is assigned the variable pointer of PA$. We poke the true length of PA$ into VL. We poke the starting address of PA$ into VL+1. Now *Buffer Stuffer* knows how long the string is and where to look for it. We evoke the string editor. Upon return, VL contains the new length. We poke the new length into the variable pointer of PA$. We restore the routine's activation/deactivation execution address. Finally, we return the new value of PA$ to the program's calling routine.

If you decide to use this string edit option, it is imperative the commands in Line 10000 be preserved.

Concluding Remarks

It is not by chance the program is exactly one graphics page in length. My goal was to pack all those keyboard options into precisely 1,536 bytes of memory. Many more options could be added, but it would be very difficult to do so without requiring more memory. One way to do so would be to use a completely stack oriented approach. I chose not to use that approach because, although it would save memory, the program would become much more difficult to follow, let alone to understand.

In any event, by using *Buffer Stuffer*, you'll no longer need to be a huffer or a puffer!

Listing 1:

```
                  00010 *ASSEMBLY LANGUAGE SOURCE CODE
                  00020 *BUFFER STUFFER (C) 1984
                  00030 *by Richard W. Rutter
                  00040 *
0000              00050  ORG 0 ;SIMPLIFY OFFSET LOADING
                  00060 *
                  00070 *MISC EQUATES
                  00080 *
         006F     00090 DEVNUM EQU 111 ;DEVICE NUMBER
         0070     00100 IOBUFF EQU 112 ;I/O BUFFER
         0088     00110 VIDPOS EQU 136 ;VIDEO POSITION
         00D7     00120 EDTCNT EQU 215 ;LINE EDIT COUNT
         016A     00130 INPVEC EQU 362 ;ROM INPUT VECT
         02DD     00140 BSTART EQU 733 ;BUFFER START
         05E0     00150 SCROPO EQU 1504 ;SCROLL POS
         05FF     00160 SCREND EQU 1535 ;SCREEN END
         85B4     00170 GETEND EQU 34228 ;GET LINE END
         9FFF     00180 LEDVEC EQU 40959 ;LINE EDIT VEC
         A000     00190 POLCAT EQU 40960 ;SCAN KEYBOARD
         A002     00200 CHROUT EQU 40962 ;PRINT CHARS
         A199     00210 FLASH EQU 41369 ;FLASH CURSOR
         A39A     00220 INPUT EQU 41882 ;BAS ROM INPUT
                  00230 *
                  00240 *MISC PROMPT STRINGS
                  00250 *
0000     41       00260 ASKU FCC "A/C/G:"
         2F
         43
         2F
         47
         3A
0006     FF       00270  FCB 255
0007     80       00280 BUFPRO FCB 128
0008     42       00290  FCC "BUF:"
         55
         46
         3A
000C     FF       00300  FCB 255
000D     80       00310 LTBPRO FCB 128
000E     4C       00320  FCC "LTAB:"
         54
         41
         42
         3A
0013     FF       00330  FCB 255
0014     80       00340 MASPRO FCB 128
0015     4D       00350  FCC "MASK:"
         41
         53
         4B
         3A
001A     FF       00360  FCB 255
001B     80       00370 RTBPRO FCB 128
001C     52       00380  FCC "RTAB:"
         54
         41
         42
         3A
0021     FF       00390  FCB 255
0022     80       00400 RSPPRO FCB 128
0023     53       00410  FCC "SPEED:"
         50
         45
         45
         44
         3A
0029     FF       00420  FCB 255
002A     80       00430 UNMPRO FCB 128
002B     55       00440  FCC "UNMASK:"
         4E
         4D
         41
         53
         4B
         3A
0032     FF       00450  FCB 255
                  00460 *
                  00470 *RESERVED SYMBOLIC LOCATIONS
                  00480 *
0033     FA       00490 MAXBUF FCB 250 ;MAX BUFFER SIZE
0034     FA       00500 BUFLIM FCB 250 ;BUFFER LIMIT
0035     0A       00510 CONKEY FCB 10 ;CONTROL KEY
0036     13       00520 REPKEY FCB 19 ;REPEAT KEY
0037     9F       00530 CONCUR FCB 159 ;CONTROL CURSOR
0038     FF       00540 EXCCUR FCB 255 ;EXCHANGE CURSOR
0039     05       00550 LTBSIZ FCB 5 ;LEFT TAB SIZE
003A     05       00560 RTBSIZ FCB 5 ;RIGHT TAB SIZE
003B     28       00570 RSPEED FCB 40 ;REPEAT SPEED
003C     01       00580 MINVAL FCB 1 ;MINIMUM VALUE
003D     01       00590 CURVAL FCB 1 ;CURRENT VALUE
003E     00       00600 OLDVID FCB 0 ;OLD VIDEO POS
003F     00       00610  FCB 0
0040     00       00620 EOBUF FCB 0 ;TEMP END OF BUFFER
0041     00       00630  FCB 0
0042     00       00640 TMPX FCB 0 ;FOR REGISTER X
0043     00       00650  FCB 0
0044     00       00660 CURPOS FCB 0 ;CURSOR POSITION
0045     00       00670  FCB 0
0046     00       00680 EXCHAN FCB 0 ;EXCHANGE FLAG
0047     00       00690 UNITS FCB 0 ;DIGIT 0-9
0048     00       00700 TENS FCB 0 ;DIGIT 0-9
0049     00       00710 HUNS FCB 0 ;DIGIT 0-9
004A     00       00720 CURKEY FCB 0 ;CURRENT KEYVALUE
004B     00       00730 REPEAT FCB 0 ;REPEAT INDICATOR
004C     00       00740 RTBCNT FCB 0 ;RIGHT TAB COUNT
004D     00       00750 LTBCNT FCB 0 ;LEFT TAB COUNT
004E     00       00760 VARLEN FCB 0 ;STRING VAR LENGTH
004F     A0       00770 VLOC FCB 160 ;LOCATION OF BASIC
0050     00       00780  FCB 0 ;STRING VARIABLE
```

```
0051         00          00790 BUFCNT FCB 0 ;BUFFER CHAR COUNT
0052         00          00800 BKUCNT FCB 0 ;PROMPT BACKUP CNT
0053         00          00810 MASK FCB 0 ;MASK VALUE TABLE OF
0054         00          00820  FCB 0 ;UP TO 10 KEYS
0055         00          00830  FCB 0
0056         00          00840  FCB 0
0057         00          00850  FCB 0
0058         00          00860  FCB 0
0059         00          00870  FCB 0
005A         00          00880  FCB 0
005B         00          00890  FCB 0
005C         00          00900  FCB 0
005D         FF          00910  FCB 255 ;SHOW MASK TABLE END
                         00920 *
                         00930 *ENABLE THE ROUTINE
                         00940 *
005E AE      8D 059B     00950 HOOK LDX 1+RETBAS,PCR ;IS THE
0062 8C      FFFF        00960  CMPX #65535 ;HOOK IN EFFECT?
0065 26      16          00970  BNE UNHOOK ;YES,UNHOOK IT
0067 B6      016A        00980  LDA INPVEC ;GET JMP COMMAND
006A A7      8D 058E     00990  STA RETBAS,PCR ;COPY IT
006E BE      016B        01000  LDX INPVEC+1 ;GET MEMORY LOC
0071 AF      8D 0588     01010  STX 1+RETBAS,PCR ;COPY IT
0075 30      8D 0116     01020  LEAX CHECK,PCR ;GET PROG START
0079 BF      016B        01030  STX INPVEC+1 ;PLUG INTO BASIC
007C 39                  01040  RTS  ;HOOK COMPLETED
                         01050 *
                         01060 *DISABLE THE ROUTINE
                         01070 *
007D AE      8D 057C     01080 UNHOOK LDX 1+RETBAS,PCR ;GET IT
0081 BF      016B        01090  STX INPVEC+1 ;SET NORMAL BASIC
0084 30      8D 0575     01100  LEAX 1+RETBAS,PCR ;GET RET LOC
0088 86      FF          01110  LDA #255 ;RESET HOOK INDICATOR
008A A7      84          01120  STA ,X ;STORE ONE
008C A7      01          01130  STA 1,X ;AND THE OTHER
008E 39                  01140  RTS  ;UNHOOK COMPLETED
                         01150 *
                         01160 *ROUTINE TO EDIT BASIC STRINGS
                         01170 *
008F 10AE    8C BC       01180 GETVAR LDY VLOC,PCR ;BAS VARPTR
0093 8E      02DD        01190  LDX #BSTART ;GET BUFFER START
0096 5F                  01200  CLRB  ;SET COUNTER
0097 6D      8C B4       01210  TST VARLEN,PCR ;NULL STRING?
009A 27      0E          01220  BEQ NTS ;YES,NOTHING TO SEND
009C A6      A0          01230 GET1 LDA ,Y+ ;GET VARIABLE
009E A7      80          01240  STA ,X+ ;PUT INTO BUFFER
00A0 AD      9F A002     01250  JSR >[CHROUT] ;SEND TO SCREEN
00A4 5C                  01260  INCB  ;UPDATE COUNTER
00A5 E1      8C A6       01270  CMPB VARLEN,PCR ;ALL SENT?
00A8 25      F2          01280  BLO GET1 ;CONTINUE
00AA 5C                  01290 NTS INCB  ;BUFFER SIZE FOR ROM
00AB E7      8C A3       01300  STB BUFCNT,PCR ;SAVE IT
00AE 0F      6F          01310 GET2 CLR DEVNUM ;KEYBOARD INPUT
00B0 0F      70          01320  CLR IOBUFF ;CLEAR I/O BUFFER
00B2 BD      A39A        01330  JSR INPUT ;EVOKE ROM INPUT
00B5 33      8D FF47     01340  LEAU ASKU,PCR ;GET PROMPT
00B9 17      0298        01350  LBSR SENPRO ;SEND IT
00BC 8D      61          01360 GET3 BSR GKEY ;SEEK KEYPRESS
00BE 27      FC          01370  BEQ GET3 ;CONT TILL PRESSED
00C0 17      0504        01380  LBSR MAKCAP ;CONVERT TO CAPS
00C3 34      02          01390  PSHS A ;SAVE THE KEYPRESS
00C5 17      02A1        01400  LBSR BKUP ;ERASE PROMPT
00C8 35      02          01410  PULS A ;GET THE KEYPRESS
00CA E6      8C 84       01420  LDB BUFCNT,PCR ;GET #CHARS
00CD 81      47          01430  CMPA #'G ;IS STRING GOOD?
00CF 27      2A          01440  BEQ GIVVAR ;YES,SEND TO BASIC
00D1 AE      8D FF6D     01450  LDX TMPX,PCR ;GET X REGISTER
00D5 EE      8D FF65     01460  LDU OLDVID,PCR ;GET OLD VIDEO
00D9 1183    05E0        01470  CMPU #SCROPO ;SCREEN SCROLL?
00DD 25      03          01480  BLO GET4 ;NO,IT DID NOT
00DF 33      C8 E0       01490  LEAU -32,U ;BACK UP 1 LINE
00E2 DF      88          01500 GET4 STU VIDPOS ;SET CUR VIDEO
00E4 81      41          01510  CMPA #'A ;EDIT ORIGINAL AGAIN?
00E6 27      02          01520  BEQ GETORG ;YES,GET ORIGINAL
00E8 20      C4          01530  BRA GET2 ;EDIT CURRENT STRING
00EA E6      8D FF63     01540 GETORG LDB BUFCNT,PCR ;GET BUFF
00EE 5A                  01550  DECB  ;ADJUST TO TRUE LENGTH
00EF 5D                  01560  TSTB  ;LENGTH=0?
00F0 27      9D          01570  BEQ GETVAR ;YES,CAN'T ERASE
00F2 E7      8D FF5C     01580  STB BKUCNT,PCR ;SET COUNTER
00F6 17      0270        01590  LBSR BKUP ;ERASE THE STRING
00F9 20      94          01600  BRA GETVAR ;GET THE ORIGINAL
00FB 8E      02DD        01610 GIVVAR LDX #BSTART ;BUFF START
00FE 10AE 8D FF4C        01620  LDY VLOC,PCR ;BASIC VARPTR
0103 E7      8D FF47     01630  STB VARLEN,PCR ;SET LENGTH
0107 C6      01          01640  LDB #1 ;SET COUNTER
0109 E1      8D FF41     01650  CMPB VARLEN,PCR ;ANY CHARS?
010D 27      0B          01660  BEQ NTG ;IF NOT,NONE TO GIVE
010F A6      80          01670 GIV1 LDA ,X+ ;GET CHAR
0111 A7      A0          01680  STA ,Y+ ;PUT INTO VARIABLE
0113 5C                  01690  INCB  ;UPDATE COUNTER
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0114 E1      8D FF36     01700  CMPB VARLEN,PCR ;ALL SENT?
0118 25      F5          01710  BLO GIV1 ;CONTINUE
011A 6A      8D FF30     01720 NTG DEC VARLEN,PCR ;TRUE SIZE
011E 39                  01730  RTS  ;RETURN TO BASIC PROGRAM
                         01740 *
                         01750 *KEYSCAN ROUTINES
                         01760 *
011F 6D      8D FF23     01770 GKEY TST EXCHAN,PCR ;EXCHANGE?
0123 26      14          01780  BNE GKEY2 ;NO ERASE,NO FLASH
0125 6D      8D FF22     01790  TST REPEAT,PCR ;IN REPEAT?
0129 26      07          01800  BNE GKEY1 ;ALLOW ERASE
012B 34      10          01810  PSHS X ;SAVE X
012D BD      A199        01820  JSR FLASH ;FLASH CURSOR
0130 35      10          01830  PULS X ;GET X
0132 8D      05          01840 GKEY1 BSR GKEY2 ;SEEK KEY
0134 27      02          01850  BEQ KEPCUR ;IF=0,KEEP CURSOR
0136 8D      13          01860  BSR ERCUR ;ERASE CURSOR
0138 39                  01870 KEPCUR RTS  ;RETURN KEYPRESS
0139 34      20          01880 GKEY2 PSHS Y ;SAVE Y
013B AD      9F A000     01890  JSR >[POLCAT] ;SEEK KEYPRESS
013F 35      20          01900  PULS Y ;RESTORE Y
0141 39                  01910  RTS  ;RETURN KEYSCAN CONDITION
                         01920 *
                         01930 *SPECIAL CURSOR SEND/ERASE
                         01940 *
0142 E6      8D FEF2     01950 SENCUR LDB EXCCUR,PCR ;GET CURS
0146 E7      9F 0088     01960 SENCC STB [VIDPOS] ;ON SCREEN
014A 39                  01970  RTS  ;RETURN
014B C6      60          01980 ERCUR LDB #96 ;GET SCREEN BLANK
014D 20      F7          01990  BRA SENCC ;ERASE CURSOR
                         02000 *
                         02010 *AUTO KEY REPEAT ROUTINE
                         02020 *
014F A6      8D FEF8     02030 TRYREP LDA REPEAT,PCR ;CHECK IT
0153 A1      8D FEDF     02040  CMPA REPKEY,PCR ;REPEAT ON?
0157 26      19          02050  BNE TR3 ;NO MATCH=NO REPEAT
0159 A6      8D FEED     02060  LDA CURKEY,PCR ;FETCH KEYVALUE
015D 27      13          02070  BEQ TR3 ;IF NULL,REJECT IT
015F 8D      E1          02080  BSR SENCUR ;SEND CURSOR
0161 5F                  02090  CLRB  ;SET REPEAT TIMER
0162 8D      BB          02100 TR2 BSR GKEY ;SEEK KEYPRESS
0164 26      0C          02110  BNE TR3 ;IF PRESSED,REPEAT OFF
0166 5C                  02120  INCB  ;UPDATE TIMER
0167 E1      8D FED0     02130  CMPB RSPEED,PCR ;TIME ELAPSED?
016B 25      F5          02140  BLO TR2 ;LOOP RSPEED TIMES
016D A6      8D FED9     02150  LDA CURKEY,PCR ;GET KEYVALUE
0171 39                  02160  RTS  ;SEND KEYVALUE
0172 6F      8D FED5     02170 TR3 CLR REPEAT,PCR ;STOP REPEAT
0176 8D      A7          02180  BSR GKEY ;SEEK NEW KEYPRESS
0178 27      0A          02190  BEQ TR4 ;IF NO KEY,RETURN
017A A1      8D FEB8     02200  CMPA REPKEY,PCR ;START REPEAT?
017E 27      05          02210  BEQ TR5 ;YES,TRY IT
0180 A7      8D FEC6     02220  STA CURKEY,PCR ;NEW KEYVALUE
0184 39                  02230 TR4 RTS  ;SEND KEYPRESS VALUE
0185 8D      4B          02240 TR5 BSR CHKMAS ;REPEAT MASKED?
0187 26      E9          02250  BNE TR3 ;IF SO,SEEK ANOTHER
0189 A7      8D FEBE     02260  STA REPEAT,PCR ;REPEAT ON
018D 20      C0          02270  BRA TRYREP ;REACTIVATE LOOP
                         02280 *
                         02290 *IF IN STANDARD KEYBOARD INPUT
                         02300 *MODE, PROCESS INPUT VALUES
                         02310 *
018F 0D      6F          02320 CHECK TST DEVNUM ;DEVICE=0?
0191 1026    0467        02330  LBNE RETBAS ;IF NOT,ABORT
0195 0F      70          02340  CLR IOBUFF ;CLR I/O BUFF
0197 6F      8D FEAB     02350  CLR EXCHAN,PCR ;NO EXCHANGE
019B DE      88          02360  LDU VIDPOS ;GET VIDEO POSITION
019D EF      8D FE9D     02370  STU OLDVID,PCR ;SAVE FOR LATER
01A1 E7      8D FEAC     02380  STB BUFCNT,PCR ;SAVE CHR COUNT
01A5 6D      8D FEA4     02390  TST LTBCNT,PCR ;LEFT TAB?
01A9 1026    00F3        02400  LBNE SALTAB ;YES,SATISFY IT
01AD 6D      8D FE9B     02410  TST RTBCNT,PCR ;RIGHT TAB?
01B1 1026    00F3        02420  LBNE SARTAB ;YES,SATISFY IT
01B5 AC      8D FE89     02430  CMPX TMPX,PCR ;CURSOR FROZEN?
01B9 26      04          02440  BNE CHECK1 ;NO,ALLOW REPEAT
01BB 6F      8D FE8B     02450  CLR CURKEY,PCR ;REPEAT OFF
01BF 8D      8E          02460 CHECK1 BSR TRYREP ;KEYSCAN
01C1 27      FC          02470  BEQ CHECK1 ;CONT TILL KEYPRESS
01C3 8D      86          02480  BSR ERCUR ;ERASE CURSOR
01C5 8D      0B          02490  BSR CHKMAS ;IS KEY MASKED?
01C7 27      1C          02500  BEQ CHFCON ;IF=0,NOT MASKED
01C9 A1      8D FE68     02510  CMPA CONKEY,PCR ;CNTRL MASKED?
01CD 27      16          02520  BEQ CHFCON ;ALLOW UNMASK
01CF 16      00E6        02530  LBRA HIDKEY ;HIDE MASKED KEY
                         02540 *
                         02550 *SEE IF KEYPRESS IS MASKED
                         02560 *
01D2 33      8D FE7D     02570 CHKMAS LEAU MASK,PCR ;GET TABLE
01D6 E6      C4          02580 CHKMA1 LDB ,U ;GET MASK VALUE
01D8 C1      FF          02590  CMPB #255 ;AT END OF LIST?
01DA 27      06          02600  BEQ NOMSK ;NO MASK FOUND
```

```
01DC A1    C0        02610  CMPA ,U+ ;CHECK FOR MATCH
01DE 27    03        02620  BEQ MASCHK ;THE KEY IS MASKED
01E0 20    F4        02630  BRA CHKMA1 ;CHECK EACH LOC
01E2 5F              02640 NOMSK CLRB ;SET NO MASK COND
01E3 5D              02650 MASCHK TSTB  ;SET CC
01E4 39              02660  RTS  ;RETURN RESULTS
                     02670 *
                     02680 *PROCESS THE KEYPRESS
                     02690 *
01E5 A1    8D FE4C   02700 CHFCON CMPA CONKEY,PCR ;CNTRL?
01E9 27    26        02710  BEQ PCKEY ;PROCESS CONTROL KEY
01EB 81    09        02720  CMPA #9 ;RIGHT ARROW?
01ED 26    02        02730  BNE CHF1 ;IF NOT,DON'T CONVERT
01EF 86    20        02740  LDA #32 ;CONVERT TO BLANK
01F1 17    03DA      02750 CHF1 LBSR GNCHRS ;GET #OF CHARS
01F4 E1    8D FE3C   02760  CMPB BUFLIM,PCR ;AT LIMIT?
01F8 1025 00BD       02770  LBLO SENKEY ;WE HAVE ROOM
01FC E1    8D FE51   02780  CMPB BUFCNT,PCR ;IN LINE EDIT?
0200 27    06        02790  BEQ CHF2 ;IF COUNTS MATCH,NO
0202 81    08        02800  CMPA #8 ;IS IT BACKSPACE?
0204 1026 00B0       02810  LBNE HIDKEY ;MUST BE BACKSPACE
0208 81    20        02820 CHF2 CMPA #32 ;ADD TO BUFFER?
020A 1025 00AB       02830  LBLO SENKEY ;IF NOT, SEND IT
020E 16    00A7      02840  LBRA HIDKEY ;NO ROOM,HIDE IT
                     02850 *
                     02860 *PROCESS CONTROL KEY REQUEST
                     02870 *
0211 6F    8D 03EA   02880 PCKEY CLR BOTTOM,PCR ;SET COUNT
0215 E6    8D FE1E   02890  LDB CONCUR,PCR ;CONTROL CURSOR
0219 17    FF2A      02900  LBSR SENCC ;SEND IT
021C 17    03D1      02910 GNK1 LBSR TIMER ;UPDATE TIMER
021F 27    06        02920  BEQ ECURS ;TIME TO ERASE
0221 C1    FF        02930  CMPB #255 ;TIME FOR CHANGE?
0223 27    EC        02940  BEQ PCKEY ;YES,START OVER
0225 20    03        02950  BRA GNK2 ;SEEK KEYPRESS
0227 17    FF21      02960 ECURS LBSR ERCUR ;ERASE CURSOR
022A 17    FF05      02970 GNK2 LBSR GKEY1 ;SEEK KEY
022D 27    ED        02980  BEQ GNK1 ;CONT TILL KEYPRESS
022F 6F    8D FE17   02990  CLR CURKEY,PCR ;REPEAT OFF
0233 17    0391      03000  LBSR MAKCAP ;CONVERT TO CAPS
0236 81    55        03010  CMPA #'U ;UNMASK?
0238 1027 0094       03020  LBEQ UNSMSK ;IF SO, ALLOW IT
023C 8D    94        03030  BSR CHKMAS ;CHECK FOR MASK
023E 27    02        03040  BEQ GCVAL ;IF=0,NOT MASKED
0240 20    76        03050  BRA HIDKEY ;HIDE MASKED KEY
0242 34    02        03060 GCVAL PSHS A ;SAVE THE KEYPRESS
0244 A6    8D FDED   03070  LDA CONKEY,PCR ;GET CNTRL KEY
0248 8D    88        03080  BSR CHKMAS ;TEST FOR MASK
024A 35    02        03090  PULS A ;GET THE KEYPRESS
024C 27    02        03100  BEQ FULOPT ;ALLOW FULL OPTIONS
024E 20    68        03110  BRA HIDKEY ;CONTROL WAS MASKED
                     03120 *
                     03130 *PROCESS CONTROL KEY OPTIONS
                     03140 *
0250 81    4D        03150 FULOPT CMPA #'M ;MASK A KEY?
0252 1027 009B       03160  LBEQ SETMAS ;SET MASK VALUE
0256 81    58        03170  CMPA #'X ;EXCHANGE REQUEST?
0258 1027 01C4       03180  LBEQ EXCHAR ;TRY EXCHANGE CHAR
025C 33    8D FDA7   03190  LEAU BUFPRO,PCR ;GET PROMPT
0260 81    42        03200  CMPA #'B ;SET BUFFER SIZE?
0262 1027 00B4       03210  LBEQ SETBUF ;YES
0266 33    8D FDA3   03220  LEAU LTBPRO,PCR ;GET PROMPT
026A 81    4C        03230  CMPA #'L ;SET LEFT TAB?
026C 1027 00B9       03240  LBEQ SETLTB ;YES
0270 33    8D FDA7   03250  LEAU RTBPRO,PCR ;GET PROMPT
0274 81    52        03260  CMPA #'R ;SET RIGHT TAB?
0276 1027 00B7       03270  LBEQ SETRTB ;YES
027A 33    8D FDA4   03280  LEAU RSPPRO,PCR ;GET PROMPT
027E 81    53        03290  CMPA #'S ;SET REPEAT SPEED?
0280 1027 00B6       03300  LBEQ SETREP ;YES
0284 81    08        03310  CMPA #8 ;SEND A LEFT TAB?
0286 26    0A        03320  BNE CFRTAB ;NO,CHECK FOR RIGHT
0288 E6    8D FDAD   03330  LDB LTBSIZ,PCR ;GET LEFT TAB
028C E7    8D FDBD   03340  STB LTBCNT,PCR ;SET COUNT
0290 20    0E        03350  BRA SALTAB ;SEND LEFT TAB
0292 81    09        03360 CFRTAB CMPA #9 ;SEND RIGHT TAB?
0294 26    22        03370  BNE HIDKEY ;HIDE UNUSABLE KEY
0296 E6    8D FDA0   03380  LDB RTBSIZ,PCR ;GET RIGHT TAB
029A E7    8D FDAE   03390  STB RTBCNT,PCR ;SET COUNT
029E 20    08        03400  BRA SARTAB ;SEND RIGHT TAB
02A0 86    08        03410 SALTAB LDA #8 ;GET BACKSPACE
02A2 6A    8D FDA7   03420  DEC LTBCNT,PCR ;CNT=CNT-1
02A6 20    11        03430  BRA SENKEY ;SEND THE BACKSPACE
02A8 86    20        03440 SARTAB LDA #32 ;GET BLANK
02AA 6A    8D FD9E   03450  DEC RTBCNT,PCR ;CNT=CNT-1
02AE 17    031D      03460  LBSR GNCHRS ;GET #OF CHARS
02B1 5C              03470  INCB  ;UPDATE TAB COUNTER
02B2 E1    8D FD7E   03480  CMPB BUFLIM,PCR ;AT LIMIT?
02B6 23    01        03490  BLS SENKEY ;SEND THE BLANK
                     03500 *
                     03510 *SEND VALUES TO THE ROM ROUTINE
                     03520 *
02B8 4F              03530 HIDKEY CLRA ;HIDE THE KEY
02B9 E6    8D FD94   03540 SENKEY LDB BUFCNT,PCR ;GET CNT
02BD 81    1F        03550  CMPA #31 ;REPEATABLE KEY?
02BF 22    08        03560  BHI SENK1 ;YES,PRESERVE CURKEY
02C1 81    08        03570  CMPA #8 ;REPEATABLE KEY?
02C3 27    04        03580  BEQ SENK1 ;YES,PRESERVE CURKEY
02C5 6F    8D FD81   03590  CLR CURKEY,PCR ;NO REPEAT
02C9 AF    8D FD75   03600 SENK1 STX TMPX,PCR ;COPY X
02CD 32    64        03610  LEAS 4,S ;CLEAR 2 RTS'S
02CF 39              03620  RTS  ;MAKE BASIC PROCESS KEY
                     03630 *
                     03640 *UNMASK A KEYBOARD CHAR
                     03650 *
02D0 33    8D FD56   03660 UNSMSK LEAU UNMPRO,PCR ;PROMPT
02D4 8D    7E        03670  BSR SENPRO ;SEND THE PROMPT
02D6 17    FE46      03680 UNM1 LBSR GKEY ;GET KEY
02D9 27    FB        03690  BEQ UNM1 ;MUST HAVE KEY
02DB 33    8D FD74   03700  LEAU MASK,PCR ;GET TABLE START
02DF E6    C4        03710 FINMAS LDB ,U ;GET MASK VALUE
02E1 C1    FF        03720  CMPB #255 ;AT LIST END?
02E3 27    2D        03730  BEQ MASDON ;UNMASK COMPLETE
02E5 A1    C4        03740  CMPA ,U ;MASK MATCH?
02E7 27    04        03750  BEQ FOUMSK ;IF SO,UNMASK IT
02E9 33    41        03760  LEAU 1,U ;NEXT MASK POSITION
02EB 20    F2        03770  BRA FINMAS ;CHECK ALL LOCS
02ED 6F    C4        03780 FOUMSK CLR ,U ;UNMASK THE KEY
02EF 20    21        03790  BRA MASDON ;UNMASK IS DONE
                     03800 *
                     03810 *MASK A KEYBOARD CHAR, IF ROOM
                     03820 *
02F1 33    8D FD1F   03830 SETMAS LEAU MASPRO,PCR ;PROMPT
02F5 8D    5D        03840  BSR SENPRO ;SEND PROMPT
02F7 17    FE25      03850 SET1 LBSR GKEY ;SEEK MASK VALUE
02FA 27    FB        03860  BEQ SET1 ;MUST HAVE KEY
02FC 33    8D FD53   03870  LEAU MASK,PCR ;GET TABLE START
0300 E6    C4        03880 FINFRE LDB ,U ;SEEK FREE BYTE
0302 C1    FF        03890  CMPB #255 ;AT LIST END?
0304 27    0C        03900  BEQ MASDON ;NO MORE ROOM
0306 A1    C4        03910  CMPA ,U ;ALREADY MASKED?
0308 27    08        03920  BEQ MASDON ;IF YES,WE'RE DONE
030A 6D    C4        03930  TST ,U ;FREE BYTE?
030C 27    08        03940  BEQ GOTFRE ;IF SO,USE IT
030E 33    41        03950  LEAU 1,U ;NEXT MASK POSITION
```

ADOS ENHANCED, EPROM-ABLE DISK BASIC

Now, you can supercharge Basic with an impressive array of extra features WITHOUT sacrificing compatibility! ADOS is compatible with virtually 100% of commercial software. Customizing utilities are provided to allow user-defined command abbreviations, baud rate, step rate, tracks per disk (35 or 40), support of double-sided drives, and more. After customizing ADOS, you can have it burned into an EPROM that plugs into the Disk Basic ROM socket, or just use it in RAM as a 64K disk utility. (EPROM + burning will cost about $20--we provide information concerning how you can have this done.) Features include: • repeat and edit of the last direct-mode command • 26 definable control-key abbreviations • automatic line-number prompts • DOS command • lowercase command entry (a fine complement to a Lowerkit or PBJ WordPak) • COPY (filename) to (drive number) • AE error override option • RAM command (64K) • RUNM command • text echoing to printer • ML monitor • text file scan • enhanced directory • error trapping • hi-res text utility included (42, 51, or 64 characters per line)

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```
0310 20   EE        03960  BRA FINFRE ;CONTINUE ATTEMPT
0312 8D   55        03970 MASDON BSR BKUP ;REMOVE PROMPT
0314 20   A2        03980  BRA HIDKEY ;HIDE CURRENT KEY
0316 A7   C0        03990 GOTFRE STA ,U+ ;SET THE MASK
0318 20   C5        04000  BRA FINMAS ;NO DUPLICATIONS
                    04010 *
                    04020 *SET NEW BUFFER LIMIT
                    04030 *
031A 8D   5A        04040 SETBUF BSR GN0 ;GET BUFFER LIM
031C E1   8D FD13   04050  CMPB MAXBUF,PCR ;AT MAX?
0320 27   01        04060  BEQ SETB1 ;YES,CAN'T ADJUST
0322 5C             04070  INCB  ;EXPAND TO TRUE VALUE
0323 E7   8D FD0D   04080 SETB1 STB BUFLIM,PCR ;SAVE IT
0327 20   8F        04090  BRA HIDKEY ;HIDE THE KEYPRESS
                    04100 *
                    04110 *SET NEW LEFT TAB
                    04120 *
0329 8D   4B        04130 SETLTB BSR GN0 ;GET LEFT TAB
032B E7   8D FD0A   04140  STB LTBSIZ,PCR ;SAVE IT
032F 20   87        04150  BRA HIDKEY ;HIDE THE KEYPRESS
                    04160 *
                    04170 *SET NEW RIGHT TAB
                    04180 *
0331 8D   43        04190 SETRTB BSR GN0 ;GET RIGHT TAB
0333 E7   8D FD03   04200  STB RTBSIZ,PCR ;SAVE IT
0337 16   FF7E      04210  LBRA HIDKEY ;HIDE THE KEYPRESS
                    04220 *
                    04230 *SET NEW REPEAT SPEED
                    04240 *
033A 8D   3A        04250 SETREP BSR GN0 ;GET NEW SPEED
033C E7   8D FCFB   04260  STB RSPEED,PCR ;SAVE IT
0340 16   FF75      04270  LBRA HIDKEY ;HIDE THE KEYPRESS
                    04280 *
                    04290 *ROUTINE TO CLEAR OLD VALUES
                    04300 *
0343 6F   8D FD00   04310 CLRVAL CLR UNITS,PCR ;NO UNITS
0347 6F   8D FCFD   04320  CLR TENS,PCR ;NO TENS
034B 6F   8D FCFA   04330  CLR HUNS,PCR ;NO HUNDREDS
034F 6F   8D FCEA   04340  CLR CURVAL,PCR ;VALUE=0
0353 39             04350  RTS  ;RETURN ZERO VALUES
                    04360 *
                    04370 *ROUTINE TO SEND PROMPTS
                    04380 *
0354 6F   8D FCFA   04390 SENPRO CLR BKUCNT,PCR ;SET TO 0
0358 A6   C0        04400 SEN1 LDA ,U+ ;GET CHAR
035A 81   FF        04410  CMPA #255 ;END OF PROMPT?
035C 27   0A        04420  BEQ SEN2 ;IF YES,NO MORE CHARS
035E AD   9F A002   04430  JSR >[CHROUT] ;SEND TO SCREEN
0362 6C   8D FCEC   04440  INC BKUCNT,PCR ;UPDATE COUNTER
0366 20   F0        04450  BRA SEN1 ;SEND ALL CHARS
0368 39             04460 SEN2 RTS  ;RETURN
                    04470 *
                    04480 *ROUTINE TO ERASE PROMPTS
                    04490 *
0369 86   08        04500 BKUP LDA #8 ;GET ERASE CHAR
036B AD   9F A002   04510 BK1 JSR >[CHROUT] ;ERASE A CHAR
036F 6A   8D FCDF   04520  DEC BKUCNT,PCR ;DECREASE COUNT
0373 26   F6        04530  BNE BK1 ;CONTINUE TILL 0
0375 39             04540  RTS  ;RETURN
                    04550 *
                    04560 *PROCESS SET VALUE REQUESTS
                    04570 *
0376 8D   DC        04580 GN0 BSR SENPRO ;SEND PROMPT
0378 8D   C9        04590  BSR CLRVAL ;RESET VALUES
037A C6   03        04600  LDB #3 ;GET MAX KEYPRESS COUNT
037C E7   8D 027F   04610  STB BOTTOM,PCR ;SET IT
0380 17   FD9C      04620 GN1 LBSR GKEY ;SEEK KEYPRESS
0383 27   FB        04630  BEQ GN1 ;UNTIL PRESSED
0385 81   39        04640  CMPA #'9 ;A DIGIT?
0387 22   1A        04650  BHI GN2 ;TOO BIG
0389 81   30        04660  CMPA #'0 ;A DIGIT?
038B 25   16        04670  BLO GN2 ;TOO SMALL
038D 6D   8D 026E   04680  TST BOTTOM,PCR ;AT DIGIT LIM?
0391 27   10        04690  BEQ GN2 ;3 DIGITS ENTERED
0393 6A   8D 0268   04700  DEC BOTTOM,PCR ;NEW DIGIT CNT
0397 AD   9F A002   04710  JSR >[CHROUT] ;SEND THE DIGIT
039B 6C   8D FCB3   04720  INC BKUCNT,PCR ;UPDATE COUNTER
039F 8D   29        04730  BSR GVAL ;UPDATE VALUE
03A1 20   DD        04740  BRA GN1 ;SEEK ANOTHER DIGIT
03A3 81   03        04750 GN2 CMPA #3 ;ABORT WITH BREAK?
03A5 27   1C        04760  BEQ GN3 ;YES,RETAIN PREV VALS
03A7 81   0D        04770  CMPA #13 ;RETURN REQUEST?
03A9 26   D5        04780  BNE GN1 ;IF NOT,CONTINUE
03AB 8D   BC        04790  BSR BKUP ;ERASE PROMPT
03AD E6   8D FC8C   04800  LDB CURVAL,PCR ;CURRENT VALUE
03B1 E1   8D FC87   04810  CMPB MINVAL,PCR ;IS IT>=MIN?
03B5 24   02        04820  BHS GODVAL ;GOOD VALUE
03B7 20   0C        04830  BRA GN4 ;RETAIN PREVIOUS VALS
03B9 E1   8D FC76   04840 GODVAL CMPB MAXBUF,PCR ;<=MAX?
03BD 23   03        04850  BLS ATMVAL ;YES,VALUE IS OK
03BF 5A             04860  DECB  ;ADJUST TO WITHIN RANGE
03C0 20   F7        04870  BRA GODVAL ;CONTINUE TILL GOOD
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03C2 39             04880 ATMVAL RTS  ;RETURN VALUE IN B
03C3 8D   A4        04890 GN3 BSR BKUP ;ERASE PROMPT
03C5 32   62        04900 GN4 LEAS 2,S ;REMOVE 1 RTS
03C7 16   FEEE      04910  LBRA HIDKEY ;HIDE THE KEYPRESS
                    04920 *
                    04930 *COMPUTE VALUE FOR SET REQUEST
                    04940 *
03CA 80   30        04950 GVAL SUBA #48 ;MAKE INTO NUMBER
03CC 1F   89        04960  TFR A,B ;SAVE A REGISTER
03CE 6F   8D FC6B   04970  CLR CURVAL,PCR ;VALUE=0
03D2 A6   8D FC72   04980  LDA TENS,PCR ;GET TENS
03D6 A7   8D FC6F   04990  STA HUNS,PCR ;HUNS=TENS
03DA A6   8D FC69   05000  LDA UNITS,PCR ;GET UNITS
03DE A7   8D FC66   05010  STA TENS,PCR ;TENS=UNITS
03E2 E7   8D FC61   05020  STB UNITS,PCR ;SET NEW UNITS
03E6 E7   8D FC53   05030  STB CURVAL,PCR ;SAVE UNITS
03EA A6   8D FC5A   05040  LDA TENS,PCR ;GET # OF TENS
03EE C6   0A        05050  LDB #10 ;TEN MULTIPLIER
03F0 3D             05060  MUL  ;COMPUTE TENS
03F1 EB   8D FC48   05070  ADDB CURVAL,PCR ;ADD TO UNITS
03F5 E7   8D FC44   05080  STB CURVAL,PCR ;UPDATE VALUE
03F9 A6   8D FC4C   05090  LDA HUNS,PCR ;GET HUNDREDS
03FD 81   02        05100  CMPA #2 ;HOW MANY?
03FF 22   12        05110  BHI SATMAX ;MAX OF 2 HUNDREDS
0401 25   04        05120  BLO GHUNS ;IF < 2,IT'S OK
0403 C1   37        05130  CMPB #55 ;VALUE BE > 255?
0405 22   0C        05140  BHI SATMAX ;DON'T ALLOW IT
0407 C6   64        05150 GHUNS LDB #100 ;HUNDRED MUL
0409 3D             05160  MUL  ;COMPUTE HUNDREDS
040A EB   8D FC2F   05170  ADDB CURVAL,PCR ;ADD TO VALUE
040E E7   8D FC2B   05180  STB CURVAL,PCR ;NEW VALUE
0412 39             05190  RTS  ;RETURN WITH VALUE
0413 E6   8D FC1C   05200 SATMAX LDB MAXBUF,PCR ;GET MAX
0417 E7   8D FC22   05210  STB CURVAL,PCR ;VALUE=MAXIMUM
041B E6   8D FC1E   05220 MXSVAL LDB CURVAL,PCR ;B=VALUE
041F 39             05230  RTS  ;RETURN THE NUMBER
                    05240 *
                    05250 *BUFFER CHAR EXCHANGE ROUTINE
                    05260 *
0420 6C   8D FC22   05270 EXCHAR INC EXCHAN,PCR ;FLAG IT
0424 17   01A7      05280  LBSR GNCHRS ;GET #CHARS
0427 6F   84        05290  CLR ,X ;CLEAR END OF LINE AND
0429 6F   01        05300  CLR 1,X ;END OF LINE + 1
042B 7D   02DD      05310  TST BSTART ;ANYTHING TO EDIT?
042E 1027 FE86      05320  LBEQ HIDKEY ;NO,BUFFER EMPTY
0432 E7   8D FC1B   05330  STB BUFCNT,PCR ;SAVE COUNTER
0436 AF   8D FC06   05340  STX EOBUF,PCR ;SET END OF BUF
043A 34   20        05350  PSHS Y ;SAVE Y
043C 30   1F        05360  LEAX -1,X ;POINT TO LAST CHAR
043E 109E 88        05370  LDY VIDPOS ;GET VIDEO POS
0441 10AF 8D FBF8   05380  STY OLDVID,PCR ;SAVE IT
0446 31   3F        05390  LEAY -1,Y ;POINT TO LAST CHAR
0448 109F 88        05400  STY VIDPOS ;SET TEMP VIDEO POS
044B 6F   8D FBFB   05410 EX0 CLR CURKEY,PCR ;STOP REPEAT
044F 6F   8D 01AC   05420 EX1 CLR BOTTOM,PCR ;SET COUNT
0453 17   FCEC      05430  LBSR SENCUR ;SEND THE CURSOR
0456 17   0197      05440 EX2 LBSR TIMER ;UPDATE TIMER
0459 27   06        05450  BEQ EX3 ;SEND CURRENT CHAR
045B C1   FF        05460  CMPB #255 ;TIME FOR CHANGE?
045D 27   F0        05470  BEQ EX1 ;RESET COUNTER
045F 20   03        05480  BRA ED4 ;SEEK KEYPRESS
0461 17   014B      05490 EX3 LBSR PUTSCR ;CHAR ON SCREEN
0464 17   FCE8      05500 ED4 LBSR TRYREP ;ALLOW REPEAT
0467 27   ED        05510  BEQ EX2 ;MUST HAVE KEYPRESS
0469 17   0143      05520  LBSR PUTSCR ;CHAR ON SCREEN
046C AF   8D FBD2   05530  STX TMPX,PCR ;SAVE X REGISTER
0470 81   08        05540  CMPA #8 ;BACK UP?
0472 27   16        05550  BEQ BKUP1 ;YES,BACK UP 1
0474 81   09        05560  CMPA #9 ;MOVE FORWARD?
0476 27   23        05570  BEQ FO1 ;YES,MOVE FORWARD 1
0478 81   0C        05580  CMPA #12 ;DELETE A CHAR?
047A 1027 00AE      05590  LBEQ TRYDEL ;TRY TO DELETE
047E 81   0D        05600  CMPA #13 ;DONE?
0480 1027 0106      05610  LBEQ EXDONE ;YES,EXCHANGE DONE
0484 81   20        05620  CMPA #32 ;PRINTABLE?
0486 24   26        05630  BHS TRYINS ;YES,TRY TO INSERT
0488 20   C1        05640  BRA EX0 ;INVALID COMMAND
                    05650 *
                    05660 *MOVE CURSOR TO LEFT
                    05670 *
048A 8C   02DD      05680 BKUP1 CMPX #BSTART ;BUFF START?
048D 27   BC        05690  BEQ EX0 ;IF YES,LEFT JUSTIFIED
048F 30   1F        05700  LEAX -1,X ;BACK UP X
0491 109E 88        05710  LDY VIDPOS ;GET VIDEO POSITION
0494 31   3F        05720  LEAY -1,Y ;BACK IT UP
0496 109F 88        05730  STY VIDPOS ;UPDATE IT
0499 20   B4        05740  BRA EX1 ;CONTINUE
                    05750 *
                    05760 *MOVE CURSOR TO RIGHT
                    05770 *
049B 109E 88        05780 FO1 LDY VIDPOS ;GET VIDEO POS
```

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049E 31   21      05790  LEAY 1,Y ;POINT TO NEXT POS
04A0 10AC 8D FB99 05800  CMPY OLDVID,PCR ;AT END?
04A5 27   A4      05810  BEQ EX0 ;YES,REJECT
04A7 109F 88      05820  STY VIDPOS ;NEW VIDEO POS
04AA 30   01      05830  LEAX 1,X ;NEW BUFFER POINTER
04AC 20   A1      05840  BRA EX1 ;CONTINUE
                  05850 *
                  05860 *INSERT A CHAR
                  05870 *
04AE E6   8D FB9F 05880 TRYINS LDB BUFCNT,PCR ;GET CHRS
04B2 E1   8D FB7E 05890  CMPB BUFLIM,PCR ;ANY ROOM?
04B6 24   93      05900  BHS EX0 ;NO,REJECT
04B8 10AE 8D FB83 05910  LDY EOBUF,PCR ;GET END OF BUF
04BD E6   A2      05920 MOVINB LDB ,-Y ;GET LEFT CHAR
04BF E7   21      05930  STB 1,Y ;PUT IN CURR BUF POS
04C1 10AC 8D FB7C 05940  CMPY TMPX,PCR ;Y=X?
04C6 22   F5      05950  BHI MOVINB ;REPEAT TILL Y=X
04C8 A7   84      05960  STA ,X ;INSERT THE CHAR
04CA 10AE 8D FB71 05970  LDY EOBUF,PCR ;GET END OF BUF
04CF 31   21      05980  LEAY 1,Y ;UPDATE IT
04D1 10AF 8D FB6A 05990  STY EOBUF,PCR ;SAVE IT
04D6 6F   A4      06000  CLR ,Y ;SHOW END OF LINE
04D8 109E 88      06010  LDY VIDPOS ;GET VIDEO POSITION
04DB 31   21      06020  LEAY 1,Y ;UPDATE IT
04DD 10AF 8D FB62 06030  STY CURPOS,PCR ;SAVE IT
04E2 1F   12      06040  TFR X,Y ;GIVE X TO Y
04E4 A6   A0      06050 MOVONS LDA ,Y+ ;GET A CHAR
04E6 27   23      06060  BEQ ALLMOV ;IF=0,ALL MOVED
04E8 9E   88      06070  LDX VIDPOS ;GET VIDEO POSITION
04EA 8C   05FF    06080  CMPX #SCREND ;AT SCREEN END
04ED 25   16      06090  BLO WNSCR ;CHROUT WON'T SCROLL
04EF AE   8D FB4B 06100  LDX OLDVID,PCR ;GET OLD VIDEO
04F3 30   88 E0   06110  LEAX -32,X ;BACK UP 1 LINE
04F6 AF   8D FB44 06120  STX OLDVID,PCR ;SAVE IT
04FA AE   8D FB46 06130  LDX CURPOS,PCR ;GET CUR POS
04FE 30   88 E0   06140  LEAX -32,X ;BACK UP 1 LINE
0501 AF   8D FB3F 06150  STX CURPOS,PCR ;SAVE IT
0505 AD   9F A002 06160 WNSCR JSR >[CHROUT] ;TO SCREEN
0509 20   D9      06170  BRA MOVONS ;MOVE THEM ALL
050B 10AE 8D FB34 06180 ALLMOV LDY CURPOS,PCR ;CURS POS
0510 109F 88      06190  STY VIDPOS ;SET VIDEO POSITION
0513 10AE 8D FB26 06200  LDY OLDVID,PCR ;GET OLD VIDEO
0518 31   21      06210  LEAY 1,Y ;UPDATE IT
051A 10AF 8D FB1F 06220  STY OLDVID,PCR ;SAVE IT
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051F AE   8D FB1F 06230  LDX TMPX,PCR ;GET REG X
0523 30   01      06240  LEAX 1,X ;NEW POINTER
0525 6C   8D FB28 06250  INC BUFCNT,PCR ;UPDATE COUNT
0529 16   FF23    06260  LBRA EX1 ;CONTINUE
                  06270 *
                  06280 *DELETE A CHAR
                  06290 *
052C 7D   02DE    06300 TRYDEL TST 1+BSTART ;#CHARS?
052F 1027 FF18    06310  LBEQ EX0 ;MUST BE > 1 CHAR
0533 109E 88      06320  LDY VIDPOS ;GET VIDEO POS
0536 E6   01      06330 DELINB LDB 1,X ;GET NEXT CHAR
0538 E7   80      06340  STB ,X+ ;PUT IN CURRENT LOC
053A 5D           06350  TSTB  ;B=0?
053B 26   F9      06360  BNE DELINB ;CONT IF NOT=0
053D AE   8D FB01 06370  LDX TMPX,PCR ;GET POINTER
0541 6D   84      06380  TST ,X ;AT LINE END?
0543 26   04      06390  BNE KEEPOS ;IF NOT,KEEP POS
0545 30   1F      06400  LEAX -1,X ;BACK UP ONE
0547 31   3F      06410  LEAY -1,Y ;BACK UP ONE
0549 109F 88      06420 KEEPOS STY VIDPOS ;UPDATE IT
054C 10AF 8D FAF3 06430  STY CURPOS,PCR ;SAVE IT
0551 1F   12      06440  TFR X,Y ;GIVE TO Y REG
0553 A6   A0      06450 DELONS LDA ,Y+ ;GET A CHAR
0555 27   06      06460  BEQ DOS ;IF=0,SCREEN FIXED
0557 AD   9F A002 06470  JSR >[CHROUT] ;SEND TO SCREEN
055B 20   F6      06480  BRA DELONS ;MOVE ALL CHARS
055D 86   20      06490 DOS LDA #32 ;GET BLANK
055F AD   9F A002 06500  JSR >[CHROUT] ;ERASE LAST CHAR
0563 10AE 8D FADC 06510  LDY CURPOS,PCR ;GET CURSOR POS
0568 109F 88      06520  STY VIDPOS ;SET NEW POSITION
056B 10AE 8D FACE 06530  LDY OLDVID,PCR ;GET OLD VIDEO
0570 31   3F      06540  LEAY -1,Y ;BACK IT UP
0572 10AF 8D FAC7 06550  STY OLDVID,PCR ;SAVE IT
0577 10AE 8D FAC4 06560  LDY EOBUF,PCR ;GET END OF BUF
057C 31   3F      06570  LEAY -1,Y ;BACK IT UP
057E 10AF 8D FABD 06580  STY EOBUF,PCR ;SAVE IT
0583 6A   8D FACA 06590  DEC BUFCNT,PCR ;UPDATE COUNTER
0587 16   FEC5    06600  LBRA EX1 ;CONTINUE
                  06610 *
                  06620 *EXIT EXCHANGE ROUTINE
                  06630 *
058A 10AE 8D FAAF 06640 EXDONE LDY OLDVID,PCR ;OLD VID
058F 109F 88      06650  STY VIDPOS ;RESTORE IT
0592 35   20      06660  PULS Y ;RESTORE Y
0594 AE   8D FAA8 06670  LDX EOBUF,PCR ;GET END OF BUFF
0598 6A   8D FAAA 06680  DEC EXCHAN,PCR ;ADJUST FLAG
059C 1027 FD18    06690  LBEQ HIDKEY ;NOT IN LINE EDIT
05A0 E6   8D FAAD 06700  LDB BUFCNT,PCR ;GET BUFFER CNT
05A4 C0   02      06710  SUBB #2 ;ADJUST FOR LINE EDIT
05A6 D7   D7      06720  STB EDTCNT ;UPDATE EDIT COUNT
05A8 6F   8D FAA5 06730  CLR BUFCNT,PCR ;SET TO ZERO
05AC 16   FD09    06740  LBRA HIDKEY ;HIDE THE KEY
                  06750 *
                  06760 *SHOW CHARACTER DURING EXCHANGE
                  06770 *
05AF E6   84      06780 PUTSCR LDB ,X ;GET CHAR
05B1 8D   05      06790  BSR FIXIT ;CONVERT FOR SCREEN
05B3 E7   9F 0088 06800  STB [VIDPOS] ;PUT ON SCREEN
05B7 39           06810  RTS
                  06820 *
                  06830 *CONVERT FOR SCREEN
                  06840 *
05B8 C1   40      06850 FIXIT CMPB #64 ;SCREEN ADJUST
05BA 25   05      06860  BLO INC64 ;TOO SMALL
05BC C1   61      06870  CMPB #97
05BE 24   04      06880  BHS DEC96 ;TOO BIG
05C0 39           06890  RTS  ;JUST RIGHT
05C1 CB   40      06900 INC64 ADDB #64
05C3 39           06910  RTS
05C4 C0   60      06920 DEC96 SUBB #96
05C6 39           06930  RTS
                  06940 *
                  06950 *CONVERT LOWER TO UPPER CASE
                  06960 *
05C7 81   61      06970 MAKCAP CMPA #97 ;LOWER CASE?
05C9 25   02      06980  BLO ISUPP ;NO,IT'S UPPER
05CB 80   20      06990  SUBA #32 ;CONVERT TO UPPER
05CD 39           07000 ISUPP RTS  ;RETURN USABLE KEY
                  07010 *
                  07020 *SEE IF LINE EDIT IS IN CONTROL
                  07030 *
05CE E6   8D FA7F 07040 GNCHRS LDB BUFCNT,PCR ;GET CNT
05D2 EE   66      07050  LDU 6,S ;GET STACK LOCATION
05D4 1183 9FFF    07060  CMPU #LEDVEC ;IN LINE EDIT?
05D8 22   09      07070  BHI NLEDIT ;NOT IN LINE EDIT
05DA D6   D7      07080  LDB EDTCNT ;GET EDIT COUNT
05DC 5C           07090  INCB  ;LINE EDIT ADJUST
05DD 6D   8D FA65 07100  TST EXCHAN,PCR ;DESIRE EXCHAN?
05E1 26   01      07110  BNE DOEXCH ;YES,DO EXCHANGE
05E3 39           07120 NLEDIT RTS  ;RETURN CHAR COUNT
05E4 6C   8D FA5E 07130 DOEXCH INC EXCHAN,PCR ;ADJUST
```

RAM 16

PLUG IN MEMORY FOR YOUR COCO

Plug 16K memory into your CoCo cartridge slot. Absolutely no internal modifications are required. RAM-16 has low power drain because like your CoCo, RAM-16 contains reliable dynamic RAM memory.

RAM-16 is not just another memory add-on, it has many uses including:

Save your ROMPAK programs on tape and run them in the RAM-16. Reduce wear and tear on your CoCo connector and ROMPAKs. This also lets you modify your ROM based programs.

Using software provided with the RAM-16 you can run BASIC programs in the RAM-16 and use Color Computer memory for machine language or graphics memory. (16K CoCos with RAM-16 can run programs that require 16K mem for BASIC 12K for GRAPHICS pages (PCLEAR8) and still have 2.5K left for machine language subroutines.) Or load up to 16K of machine language programs in the RAM-16 and reserve all of main memory for basic or those large graphics programs.

Develop and test programs in a RAM environment before committing them to ROM or EPROM. WRITE PROTECT logic in the RAM-16 simulates true ROM operation.

RAM-16 uses a high quality glass/epoxy PC Board with GOLD contacts for RELIABLE operation and is packaged in a well made plastic case that is styled to match your Color Computer.

RAM-16 is designed specifically for the original Color Computer in the 4K, 16K or 32K memory size. (Gray Case Model). RAM-16 will operate with Color Basic or Extended Color Basic.

RAM-16 comes with a cassette tape containing a test program that tests all RAM-16 functions and a utility program that lets you use it with your basic programs.

RAM-16 comes with a complete Users Manual containing a circuit diagram and applications information.

Price $129.95 (U.S.) plus $5.00 (U.S.) Shipping and handling. (Ontario residents must include 7% prov sales tax.)

Send your check or money order to:

MICRO ACCESSORIES
P.O. Box 11067 Stn H
NEPEAN Ont. Canada. K2H 7T8

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```
05E8 BD    85B4     07140  JSR GETEND ;GET LINE END
05EB D6    D7       07150  LDB EDTCNT ;GET EDIT COUNT
05ED CB    02       07160  ADDB #2 ;ADJUST FOR EXCHANGE
05EF 39             07170  RTS  ;RETURN COUNT IN B
                    07180 *
                    07190 *SPECIAL CURSOR FLASH TIMER
                    07200 *
05F0 E6    8D 000B  07210 TIMER LDB BOTTOM,PCR ;GET COUNT
05F4 5C             07220  INCB  ;UPDATE IT
05F5 E7    8D 0006  07230  STB BOTTOM,PCR ;SAVE IT
05F9 C1    7F       07240  CMPB #127 ;CHECK CONDITON
05FB 39             07250  RTS  ;RETURN CONDITION
                    07260 *
                    07270 *IF BUFFER STUFFER CANNOT BE
                    07280 *USED, RETURN IS MADE HERE
                    07290 *
05FC       FF       07300 RETBAS FCB 255 ;ALLOW
05FD       FF       07310  FCB 255 ;ROUTINE
05FE       FF       07320  FCB 255 ;DEACTIVATION
05FF       FF       07330 BOTTOM FCB 255 ;OBJECT CODE END
                    07340 *"BOTTOM" IS ALSO USED AS A
                    07350 *COUNTER FOR SEVERAL ROUTINES
           005E     07360  END HOOK
00000 TOTAL ERRORS
```

150	235	740	127
300	88	850	61
400	148	960	198
520	0	END	97
620	121		

Listing 2:

```
10 'OBJECT CODE GENERATOR
20 'BUFFER STUFFER () 1984
30 'BY Richard W. Rutter
40 CLEAR500
50 SP=49446:EP=49449'SET ROM ADD
RESSES
60 DE$="":FORA=SP TOEP:DEV$=DEV$
+CHR$(PEEK(A)):NEXTA:IFDEV$<>"DI
SK"ANDSP<49465THENSP=49465:EP=49
468:GOTO60'(LOOK FOR DISK 1.0 OR
 1.1)
70 IFDEV$="DISK"THENFI=3541:L=50
76:EX=3634ELSEFI=1536:LA=3071:EX
=1629:DEV$="CASSETTE"'SET FIRST
AND LAST ADDRESSES FOR EITHER A
DISK O A NON DIS
 SYSTM
80 CLS:PRINT"CREATING OBJECT COD
E.":PRINT"PLEASE WAIT."
90 FORA=FI TOLA'USE FREE LOCAT
ONS A DETERMINED IN LINE 70
100 READB'GET THE DATA VALUE
110 CS=CS+B'UPDATE CHECKSUM
120 POKEA,B'STRE EACH VALUE
130 NEXTA
140 PRIT
150 IFCS=180207THENPRINT"CHECKSU
M IS GOOD."ELSEPRINT"SORRY, CHEC
KSUM IS BAD!":PRINT"EXAMINE YOU
```

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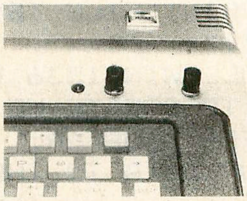

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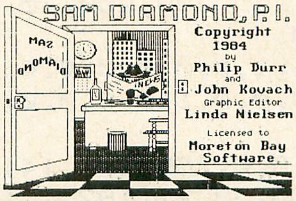

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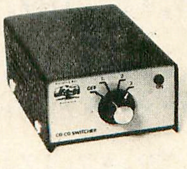

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```
DATA STATE
ENTS.":GOTO250
160 PRINT"IS "DEV$" READY (Y/N)?
:";:LININPUTQ$:Q$=LET$(Q$,1):IFQ
$<>"Y"THEN140
170 PRINT
180 PRINT"SAVING FILE 'BUFBIN'."
:PRINT"PLESE WAIT."
190 IFDEV$<>"DIK"THEN220
200 SAVEM"BUBIN.BIN",FI,L,X
210 GOTO230
220 CSAVEM"BFBIN",FI,LA,EX
230 PRINT:PRINT"FILE 'BUFBIN' NO
W ON "DEV$"."
240 'THE FOLLOWIN 1536 DATA VALU
ES ARE UED TO CREATE HE OBJECT C
ODE FR BUFFER STUFFER.  BE CERTA
IN THAT YOUR DATA IS THE SAME AS
 THIS DATA.
250 END
260 DAT 65,47,67,47,71,58,255,12
8,66,85,70,58,255,128,76,84,65,6
6,58,255
270 DATA 128,77,65,83,75,58,255,
128,82,84,65,66,58,255,128,83,80
,69,69,68
280 DATA 58,255,128,85,78,77,65,
83,75,58,255,250,250,10,19,159,2
55,5,5,40
290 DAA 1,1,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,160,0,0,0,0,0,0,0,
0,0,0,0
300 DATA 0,0,255,174,141,5,155,1
40,255,255,38,22,182,1,106,167,1
41,5,142
310 DATA 190,1,107,175,141,5,136
,48,141,1,22,191,1,107,57,174,14
1,5,124,191
320 DATA 1,107,48,141,5,117,134,
255,167,132,167,1,57,16,174,140,
188,142,2
330 DATA 221,95,109,140,180,39,1
4,166,160,167,128,173,159,160,2,
92,225,140
340 DATA 166,37,242,92,231,140,1
63,15,111,15,112,189,163,154,51,
141,255,71
350 DATA 23,2,152,141,97,39,252,
23,5,4,52,2,23,2,161,53,2,230,14
0,132,129
360 DATA 71,39,42,174,141,255,10
9,238,141,255,101,17,131,5,224,3
7,3,51,200
370 DATA 224,223,136,129,65,39,2
,32,196,230,141,255,99,90,93,39,
157,231,141
380 DATA 255,92,23,2,112,32,148,
142,2,221,16,174,141,255,76,231,
141,255,71
```

```
390 DATA 198,1,225,141,255,65,39
,11,166,128,167,160,92,225,141,2
55,54,37
400 DATA 245,106,141,255,48,57,1
09,141,255,35,38,20,109,141,255,
34,38,7,52
410 DATA 16,189,161,153,53,16,14
1,5,39,2,141,19,57,52,32,173,159
,160,0,53
420 DATA 32,57,230,141,254,242,2
31,159,0,136,57,198,96,32,247,16
6,141,254
430 DATA 248,161,141,254,223,38,
25,166,141,254,237,39,19,141,225
,95,141,187
440 DATA 38,12,92,225,141,254,20
8,37,245,166,141,254,217,57,111,
141,254,213
450 ATA 141,167,39,10,161,141,25
4,184,39,5,167,141,254,198,57,14
1,75,38
460 DATA 233,167,141,254,190,32,
192,13,111,16,38,4,103,15,112,11
1,141,254
470 DATA 171,222,136,239,141,254
,157,231,141,254,172,109,141,254
,164,16,38
480 DATA 0,243,109,141,254,155,1
6,38,0,243,172,141,254,137,38,4,
111,141,254
490 DATA 139,141,142,39,252,141,
134,141,11,39,28,161,141,254,104
,39,22,22
500 DATA 0,230,51,141,254,125,23
0,196,193,255,39,6,161,192,39,3,
32,244,95
510 DATA 93,57,161,141,254,76,39
,38,129,9,38,2,134,32,23,3,218,2
25,141,254
520 DATA 60,16,37,0,189,225,141,
254,81,39,6,129,8,16,38,0,176,12
9,32,16,37
530 DATA 0,171,22,0,167,111,141,
3,234,230,141,254,30,23,255,42,2
3,3,209,39
540 DATA 6,193,255,39,236,32,3,2
3,255,33,23,255,5,39,237,111,141
,254,23,23
550 ATA 3,145,129,85,16,39,0,148
,141,148,39,2,32,118,52,2,166,14
1,253,237
560 DATA 141,136,53,2,39,2,32,10
4,129,77,16,39,0,155,129,88,16,3
9,1,196,51
570 DATA 141,253,167,129,66,16,3
9,0,180,51,141,253,163,129,76,16
,39,0,185
580 DATA 51,141,253,167,129,82,1
6,39,0,183,51,141,253,164,129,83
```

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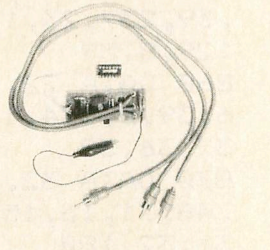

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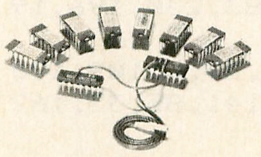

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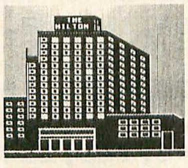

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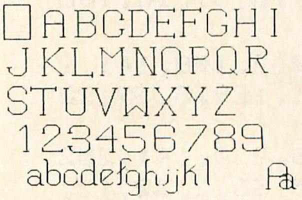

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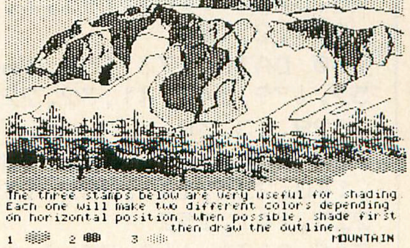
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2
3
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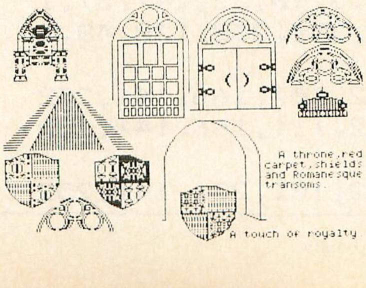
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```
,16,39,0
590 DATA 182,129,8,38,10,230,141
,253,173,231,141,253,189,32,14,1
29,9,38,34
600 DATA 230,141,253,160,231,141
,253,174,32,8,134,8,106,141,253,
167,32,17
610 DAA 134,32,106,141,253,158,2
3,3,29,92,225,141,253,126,35,1,7
9,230,141
620 DATA 253,148,129,31,34,8,129
,8,39,4,111,141,253,129,175,141,
253,117,50
630 DATA 100,57,51,141,253,86,14
1,126,23,254,70,39,251,51,141,25
3,116,230
640 DATA 196,193,255,39,45,161,1
96,39,4,51,65,32,242,111,196,32,
33,51,141
650 DATA 253,31,141,93,23,254,37
,39,251,51,141,253,83,230,196,19
3,255,39
660 DATA 12,161,196,39,8,109,196
,39,8,51,65,32,238,141,85,32,162
,167,192
670 DATA 32,197,141,90,225,141,2
53,19,39,1,92,231,141,253,13,32,
143,141,75
680 DATA 231,141,253,10,32,135,1
41,67,231,141,253,3,22,255,126,1
41,58,231
690 DATA 141,252,251,22,255,117,
111,141,253,0,111,141,252,253,11
1,141,252
700 DATA 250,111,141,252,234,57,
111,141,252,250,166,192,129,255,
39,10,173
710 DATA 159,160,2,108,141,252,2
36,32,240,57,134,8,173,159,160,2
,106,141
720 DATA 252,223,38,246,57,141,2
20,141,201,198,3,231,141,2,127,2
3,253,156
730 DAA 39,251,129,57,34,26,129,
48,37,22,109,141,2,110,39,16,106
,141,2,104
740 DATA 173,159,160,2,108,141,2
52,179,141,41,32,221,129,3,39,28
,129,13,38
750 DATA 213,141,188,230,141,252
,140,225,141,252,135,36,2,32,12,
225,141,252
760 DATA 118,35,3,90,32,247,57,1
41,164,50,98,22,254,238,128,48,3
1,137,111
770 DATA 141,252,107,166,141,252
,114,167,141,252,111,166,141,252
,105,167
780 DATA 141,252,102,231,141,252
,97,231,141,252,83,166,141,252,9
0,198,10
790 DTA 61,235,141,252,72,231,14
1,252,68,166,141,252,76,129,2,34
,18,37,4
800 DATA 193,55,34,12,198,100,61
,235,141,252,47,231,141,252,43,5
7,230,141
810 DATA 252,28,231,141,252,34,2
30,141,252,30,57,108,141,252,34,
23,1,167
820 DATA 111,132,111,1,125,2,221
,16,39,254,134,231,141,252,27,17
5,141,252
830 ATA 6,52,32,48,31,16,158,136
,16,175,141,251,248,49,63,16,159
,136,111
840 DATA 141,251,251,111,141,1,1
72,23,252,236,23,1,151,39,6,193,
255,39,240
850 DATA 32,3,23,1,75,23,252,232
,39,237,23,1,67,175,141,251,210,
129,8,39
860 DATA 22,129,9,39,35,129,12,1
6,39,0,174,129,13,16,39,1,6,129,
32,36,38
870 DATA 32,193,140,2,221,39,188
,48,31,16,158,136,49,63,16,159,1
36,32,180
880 DTA 16,158,136,49,33,16,172,
141,251,153,39,164,16,159,136,48
,1,32,161
890 DATA 230,141,251,159,225,141
,251,126,36,147,16,174,141,251,1
31,230,162
900 DATA 231,33,16,172,141,251,1
24,34,245,167,132,16,174,141,251
,113,49,33
910 DATA 16,175,141,251,106,111,
164,16,158,136,49,33,16,175,141,
251,98,31
920 DATA 18,166,160,39,35,158,13
6,140,5,255,37,22,174,141,251,75
,48,136,224
930 DATA 175,141,251,68,174,141,
251,70,48,136,224,175,141,251,63
,173,159
940 DATA 160,2,32,217,16,174,141
,251,52,16,159,136,16,174,141,25
1,38,49,33
950 DATA 16,175,141,251,31,174,1
41,251,31,48,1,108,141,251,40,22
,255,35,125
960 DATA 2,222,16,39,255,24,16,1
58,136,230,1,231,128,93,38,249,1
74,141,251
970 DATA 1,109,132,38,4,48,31,49
,63,16,159,136,16,175,141,250,24
3,31,18,166
```

```
980 DATA 160,39,6,173,159,160,2,
32,246,134,32,173,159,160,2,16,1
74,141,250
990 DATA 220,16,159,136,16,174,1
41,250,206,49,63,16,175,141,250,
199,16,174
1000 DATA 141,250,196,49,63,16,1
75,141,250,189,106,141,250,202,2
2,254,197
1010 DATA 16,174,141,250,175,16,
159,136,53,32,174,141,250,168,10
6,141,250
1020 DATA 170,16,39,253,24,230,1
41,250,173,192,2,215,215,111,141
,250,165,22
1030 DAA 253,9,230,132,141,5,231
,159,0,136,57,193,64,37,5,193,97
,36,4,57
1040 DATA 203,64,57,192,96,57,12
9,97,37,2,128,32,57,230,141,250,
127,238,102
1050 DATA 17,131,159,255,34,9,21
4,215,92,109,141,250,101,38,1,57
,108,141,250
1060 DATA 94,189,133,180,214,215
,203,2,57,230,141,0,11,92,231,14
1,0,6,193
1070 DATA 127,57,255,255,255,255
```

Listing 3:

```
10 'STRING EDIT DRIVER PROGRAM
20 'BUFFER STUFFER, (C) 1984,
30 'by Richard W. Rutter
40 CLEAR1000
50 OF=3541'MANDATORY EXECUTION O
FFSET FOR DISK.  FOR CASSETTE SY
STEMS, USE "OF=1536"
60 LINEINPUT"QUIT OR STRING ENTR
Y?:";ST$
70 Q$=LEFT$(ST$,3):IFQ$="QUI"THE
NEND
80 PA$=ST$
90 PRINT:PRINT"[IN STRING EDIT M
DE]":GOSUB10000
100 ST$=PA$
110 PRINT"STRING EDIT RESULTS:":
PRINT"["ST$"]"
120 GOO60
10000 EL=157:EA=PEEK(EL):EB=PEEK
(EL+1):VP=0:VL=78+OF:LE=LEN(PA$)
:PA$=PA$+STRING$(255-LE,32):VP=V
ARPTR(PA$):POKEVL,LE:POKEVL+1,PE
EK(VP+2):POKEVL+2,PEEK(VP+3):EXE
C143+OF:POKEVP,PEEK(VL):POKEEL,E
A:POKEL+1,EB:RETURN
```

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Staging The Final Scene Of The 51-Column Screen

By R. Bartly Betts
Rainbow Contributing Editor
With Programs By Chris Bone

The last of the 51-column text generator is included in this column. From now on you will not be limited to a 32-column Color Computer screen. In fact, to celebrate the conclusion of a new screen text routine, this month's column is dedicated to printing, on and off the screen.

First, just to make changing to the new format easier, the demonstrations in this month's column are for a machine language program that finds BASIC *PRINT@* and TAB command parameters to aid you in converting them to the new screen format.

As usual, the listing for the complete 51-column display is at the end of the article. The complete listing is included for any of you who have just joined us, so you do not need to do any appending to the previous listings to get the complete program.

We have received a number of good solutions to the previous challenge to fill a display screen with alpha characters and convert all 'A' characters to asterisks. I will publish some of the best solutions and the authors' names next month. I am sure it seems like a long time between the challenge and the recognition, but the columns have to be written a couple of months before they are published and quite a time delay is involved.

Those who submitted programs have heard from me by now, the rest of you will have to wait another month.

The Groundwork

Now, about a BASIC TAB and *PRINT@* finder. In order to create a program to make changes in a BASIC program, there are a few things we must first know:

1) Where does the BASIC program begin in memory?
2) Where does the BASIC program end in memory?
3) What are the codes that pinpoint the data to be translated?

Luckily, these questions can be easily answered. First, memory locations 25 and 26 contain the pointer to the beginning of a BASIC program. To find where any BASIC program begins, multiply the value in Location 25 by 256 and add the value of Location 26.

Memory locations 27 and 28 contain the pointers for the end of a BASIC program, in the same manner. If you have not already tried something similar, enter the following BASIC program to have a look through any program in memory.

First, load a BASIC program, then using line numbers that do not conflict with your program, type and run the following listing:

(Bartly Betts is a former reporter, magazine editor and store owner now residing in Fort Worth, Texas. He has owned and operated a Color Computer for over three years and is presently taking an electronics and computer course by correspondence. Chris Bone is a college computer science major and has been programming for more than three years. He averages between six and nine hours a day on the CoCo.)

```
0 A=PEEK(25)
10 B=PEEK(26)
20 L=A*256+B
30 A=PEEK(27)
40 B=PEEK(28)
50 E=A*256+B
60 FOR X=L TO L+32
70 LN$=LN$+CHR$(PEEK(X))
80 NEXT X
90 PRINT LN$;
100 LN$=""
110 L=X
120 IF L>E THEN END ELSE 60
```

The program is rather simple, but it prints out a BASIC program, from beginning to end, in the form in which it resides in memory. The tokens for the BASIC key words are not translated and do appear as graphics characters. Running it gives you an idea of what the FIND program deals with.

The Requirements

Your translator program also needs a routine that looks through the BASIC program. As well, it needs the capability to know when it finds a *PRINT* or a TAB command and to print out the parameters it finds. The internal BASIC code for *PRINT* is 135 decimal or 87 Hex, and the ASC code for the '@' symbol is 64 decimal or 40 Hex. The internal BASIC code for TAB is 164 decimal or A4 Hex.

You need to know that the lines of the new 51-column screen contain 1.6 times as many characters as the old 32-column screen (51 divided by 32).

The following listing is the source code for a program that will search through a BASIC program's memory and locate *PRINT*@ or TAB commands. Once you have entered and assembled it, you can use it on any BASIC program. It resides in a memory graphics page and so does not interfere with any BASIC program, regardless of length.

The Rest Is Up To You

You will notice the program is just a bare minimum. We have done this because the purpose of the column is to teach assembly language programming. The program provides a base upon which you can build. Some of the things you may wish to add are:

1) A conversion to do the new TAB or *PRINT*@ calculations.
2) An option to send the printout to either the screen or a printer.
3) A routine that recognizes when

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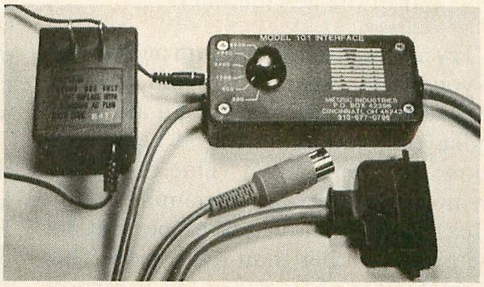

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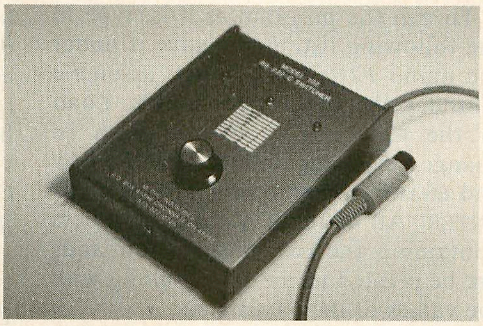

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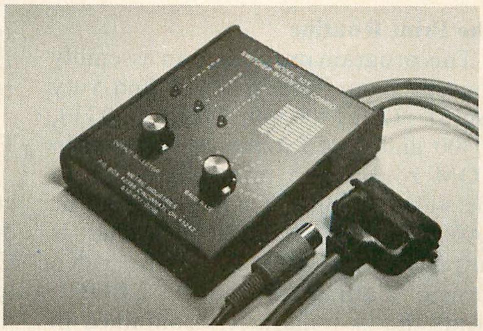

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the new number has more digits than the old number, open up the BASIC program for insertion and put in the new number.

Try adding to the program according to your skills. Again, Chris and I would be glad to see your results. To aid your endeavors, you might find it helpful to know that replacing a value of 254 in memory location 111 (decimal) or 6F (Hex) causes characters to be sent to the printer rather than the screen. The normal value of Location 111 is zero.

To run the program as it is, type in the following listing and save it under the name *FIND/SOR*, then assemble it under the name *FIND/BIN*. Load in the BASIC program you wish to change, type *LOADM "FIND/BIN* and ENTER. Then type *EXEC &HE00* ENTER. All of the BASIC line numbers containing the two target commands are be printed to the screen along with the values of the parameters.

The Print Routine

This program introduces an assembly concept I am sure you will find very useful. Lines 00260, 00290, 00330, 00400 and 00450 make use of built-in ROM routines to print characters to the video display. Calling subroutine $A002 prints whatever character is currently in register A to the video screen. Calling subroutine $BDCC prints the two characters contained in register D to the screen. Remember that register D is a 16-bit register composed to registers A and B.

The use of these ROM routines is very simple. Load the appropriate register and jump to the subroutine. When the character or characters are printed, your program continues execution where it left off. The 51-column program in this article makes use of a number of these subroutines and many will be introduced in later articles.

The second part of the print function that needs explaining is found in the last five lines of Listing 2. FCC and FCB are used to set up a table of characters to be printed.

FCC (Form Constant Character) allows you to use any character as a delimiter to establish the beginning and end of the table. In this case, the slash (/) is used as the delimiter. All characters between the slashes, including the spaces, are printed. The delimiter characters must, of course, not be included in the text.

FCB (Form Constant Byte) is used to establish a character that ends the print routine (lines 00430 to 00460). Notice that Line 440 does a comparison to see if the print character is a zero. If it is, then the routine branches back to the calling routine.

This Is It!

Now, type in and assemble your 51-column program and enjoy a new dimension in the use of your Color Computer. If you feel too finger-weary to type in the complete listing and do not subscribe to RAINBOW ON TAPE, send us $10 and we will copy and supply the utility on either disk or tape. Be sure to specify which. (In case you haven't noticed, it is cheaper to order this month's RAINBOW ON TAPE. We are not trying to compete with this excellent service.)

All functions of BASIC are preserved in the text generator, including *CLS*.

There is one promise that we have not yet fulfilled. We have had it working in this program, but decided to leave it out for now. As yet, the text generator does not have a clear to the end of line and clear to the end of the screen function. Try incorporating these functions on your own. Look at how Chris accomplished the *CLS* routine to get ideas. If you have trouble, we will provide the solution in the future.

If you come up with other enhancements, send them along. We won't provide any fortunes, but we can promise fame if you have a good routine.

Next month, we will discuss the use of ROM routines some more and continue with information on assembler commands.

If you need to contact Chris or me, please write to:

R. Bartly Betts/Chris Bone
2251 Lipscomb
Fort Worth, TX 76110
Phone (817) 924-3725
(no collect calls, please!)

51-Column Text Generator Assemble as "TEX51". To execute, type:

CLEAR1,&H7CC1:CLEAR 300
LOADM (OR CLOADM) "TEXT51"
ENTER
EXEC &H7CC2

Listing 1: (SCREEN 51)

```
7CC2            00010          ORG    $7CC2   *USE THIS LINE FOR 32K
                00020 *        ORG    $3CC2   *USE THIS LINE FOR 16K
7CC2 8E   7D58  00030 START    LDX    #GO     *CHARACTER PRINT ROUTINE
7CC5 FC   0168  00040          LDD    $168    *OLD RAM HOOK
7CC8 BF   0168  00050          STX    $168    *SAVE NEW HOOK
7CCB FD   7DB7  00060          STD    RETURN+1 *SET UP RETURN FROM PRINT
7CCE 8E   7CE1  00070          LDX    #PARSE  *PARSE ROUTINE INTERCEPT
7CD1 DC   A9    00080          LDD    $A9     *OLD PARSE ROUTINE
7CD3 9F   A9    00090          STX    $A9     *SAVE NEW HOOK
7CD5 FD   7CF8  00100          STD    PRET+1  *SET UP RETURN
7CD8 9E   BA    00110          LDX    $BA     *TOP OF VIDEO PAGE
7CDA BF   7FFC  00120          STX    POS     *CURSOR POSITION
7CDD 7F   7FFA  00130          CLR    BIT     *LEFT COLUMN
7CE0 39         00140          RTS
                00150 *************************
                00160 *A=CURRENT BYTE FROM
                00170 *BASIC PROGRAM
7CE1 81   9E    00180 PARSE    CMPA   #$9E    *TOKEN FOR CLS?
7CE3 26   15    00190          BNE    NOCLS   *NOT CLS
7CE5 34   16    00200          PSHS   D,X     *SAVE X AND D
7CE7 9E   BA    00210          LDX    $BA     *TOP OF SCREEN
7CE9 BF   7FFC  00220          STX    POS     *SAVE AS CURSOR POS
```

```
7CEC CC      FFFF      00230              LDD      #$FFFF   *WHITE
7CEF ED      81        00240 PCLS1        STD      ,X++     *WHITE OUT
7CF1 9C      B7        00250              CMPX     $B7      *SCREEN TO BOTTOM
7CF3 26      FA        00260              BNE      PCLS1
7CF5 35      16        00270              PULS     D,X      *RESTORE X AND D
7CF7 7E      1000      00280 PRET         JMP      $1000    *RETURN TO PARSE
7CFA 81      87        00290 NOCLS        CMPA     #$87     *PRINT?
7CFC 26      05        00300              BNE      PRINT    *NOT A PRINT
7CFE 73      7FFF      00310              COM      PATFL    *SET PRINT@ FLAG
7D01 20      F4        00320              BRA      PRET     *RETURN
7D03 81      40        00330 PRINT        CMPA     #64      *IS IT AN @ SYMBOL
7D05 27      09        00340              BEQ      PRINAT   *IF IT IS GOTO PRINT AT ROUTINE
7D07 81      20        00350              CMPA     #32      *SPACE (SKIP SPACE BETWEEN PRINT AND AT)
7D09 27      EC        00360              BEQ      PRET     *RETURN IF SPACE
7D0B 7F      7FFF      00370              CLR      PATFL    *NOT SPACE SO RESET PRINT FLAG
7D0E 20      E7        00380              BRA      PRET     *RETURN
7D10 7D      7FFF      00390 PRINAT       TST      PATFL    *WE GOT AN AT SO ARE WE PRINTING?
7D13 27      E2        00400              BEQ      PRET     *IF NOT RETURN
7D15 7F      7FFF      00410              CLR      PATFL    *RESET FLAG
7D18 34      16        00420              PSHS     D,X      *SAVE D AND X
7D1A 86      20        00430              LDA      #$20     *SPACE
7D1C 17      009A      00440              LBSR     LETTER   *BLANK OUT CURSOR
7D1F BD      B3E4      00450              JSR      $B3E4    *CALCULATE PRINT AT POSITION
7D22 1083 04C8         00460              CMPD     #$4C8    *PAST END OF SCREEN
7D26 1024 3720         00470              LBHS     $B44A    *FC ERROR IF SO
7D2A 1083 0032         00480 CCAL1        CMPD     #50      *CALCULATE
7D2E 23      08        00490              BLS      CCAL2    *CURSOR POSITION
7D30 83      0033      00500              SUBD     #51      *DOWN 256 BYTES FOR EACH 51 IN THE
7D33 7C      7FFF      00510              INC      PATFL    *PRINT AT LOCATION
7D36 20      F2        00520              BRA      CCAL1
7D38 86      05        00530 CCAL2        LDA      #5       *AND 5 BITS FOR EACH ONE LEFT OVER
7D3A 3D                00540              MUL               *CALCULATE # OF BITS
7D3B 34      04        00550              PSHS     B        *SAVE # OF BITS
7D3D C4      07        00560              ANDB     #7       *SAVE LSN
7D3F F7      7FFA      00570              STB      BIT      *SAVE AS BIT COUNT
7D42 B6      7FFF      00580              LDA      PATFL    *GET # LINES DOWN
7D45 35      04        00590              PULS     B        *GET # BYTES ACROSS * 8
7D47 54                00600              LSRB              *DIVIDE
7D48 54                00610              LSRB              *     BY
7D49 54                00620              LSRB              *     8
7D4A D3      BA        00630              ADDD     $BA      *ADD SCREEN OFFSET
7D4C FD      7FFC      00640              STD      POS      *SAVE CURSOR POSITION
7D4F 7F      7FFF      00650              CLR      PATFL    *RESET FLAG
7D52 35      16        00660              PULS     D,X      *GET BACK D AND X
7D54 86      20        00670              LDA      #32      *SPACE TO FOOL BASIC INTO THINKING
7D56 20      9F        00680              BRA      PRET     *THERE WAS TO @ SYMBOL
7D58 0D      6F        00690 GO           TST      $6F      *FROM LAST MONTH
7D5A 1026 0058         00700              LBNE     RETURN
7D5E 34      16        00710              PSHS     A,B,X
7D60 81      08        00720              CMPA     #8
7D62 26      13        00730              BNE      NOTBS
7D64 17      00FD      00740              LBSR     BACK
7D67 86      20        00750              LDA      #32
7D69 8D      4E        00760              BSR      LETTER
7D6B 86      20        00770              LDA      #32      *EXTRA SPACE TO ERASE CURSOR
7D6D 8D      4A        00780              BSR      LETTER
7D6F 17      00F2      00790              LBSR     BACK     *EXTRA BACKUP TO FIX EXTRA SPACE
7D72 17      00EF      00800              LBSR     BACK
7D75 20      36        00810              BRA      RET
7D77 81      0C        00820 NOTBS        CMPA     #12
7D79 26      13        00830              BNE      NOTCL
7D7B 9E      BA        00840              LDX      $BA
7D7D BF      7FFC      00850              STX      POS
7D80 7F      7FFA      00860              CLR      BIT
7D83 CC      FFFF      00870 CLS          LDD      #$FFFF
7D86 ED      81        00880 CLLOO        STD      ,X++
7D88 9C      B7        00890              CMPX     $B7
7D8A 26      FA        00900              BNE      CLLOO
7D8C 20      1F        00910              BRA      RET
```

```
7D8E 8D    29        00920 NOTCL   BSR     LETTER
7D90 BE    7FFC      00930         LDX     POS
7D93 9C    B7        00940         CMPX    $B7
7D95 25    16        00950         BLO     RET
7D97 30    89 FF00   00960         LEAX    -256,X
7D9B BF    7FFC      00970         STX     POS
7D9E 9E    BA        00980         LDX     $BA
7DA0 EC    89 0100   00990 SCLOOP  LDD     256,X
7DA4 ED    81        01000         STD     ,X++
7DA6 BC    7FFC      01010         CMPX    POS
7DA9 26    F5        01020         BNE     SCLOOP
7DAB 20    D6        01030         BRA     CLS
7DAD 86    5F        01040 RET     LDA     #95      *CURSOR SYMBOL (UNDERLINE)
7DAF 8D    08        01050         BSR     LETTER   *PRINT CURSOR
7DB1 17    00B0      01060         LBSR    BACK     *BACK UP TO CORRECT PRINT POS
```

```
7DB4 35    96        01070         PULS    A,B,X,PC
7DB6 7E    1000      01080 RETURN  JMP     $1000
7DB9 81    0D        01090 LETTER  CMPA    #$0D
7DBB 26    11        01100         BNE     LETT2
7DBD 86    20        01110         LDA     #$20
7DBF 8D    F8        01120         BSR     LETTER
7DC1 17    00A0      01130         LBSR    BACK
7DC4 7F    7FFD      01140         CLR     POS+1
7DC7 7C    7FFC      01150         INC     POS
7DCA 7F    7FFA      01160         CLR     BIT
7DCD 39              01170         RTS
7DCE C6    04        01180 LETT2   LDB     #4
7DD0 F7    7FFE      01190         STB     BYTE
7DD3 80    20        01200         SUBA    #$20
7DD5 3D              01210         MUL
7DD6 C3    7E8C      01220         ADDD    #TABLE
7DD9 1F    02        01230         TFR     D,Y
7DDB BE    7FFC      01240         LDX     POS
7DDE A6    A0        01250 LOOP    LDA     ,Y+
7DE0 34    02        01260         PSHS    A
7DE2 8A    0F        01270         ORA     #$0F
7DE4 8D    16        01280         BSR     SLICE
7DE6 35    02        01290         PULS    A
7DE8 48              01300         ASLA
7DE9 48              01310         ASLA
7DEA 48              01320         ASLA
7DEB 48              01330         ASLA
7DEC 8A    0F        01340         ORA     #$0F
7DEE 8D    0C        01350         BSR     SLICE
7DF0 7A    7FFE      01360         DEC     BYTE
7DF3 26    E9        01370         BNE     LOOP
7DF5 30    89 FF00   01380         LEAX    -256,X
7DF9 8D    42        01390         BSR     FORW
7DFB 39              01400         RTS
7DFC F6    7FFA      01410 SLICE   LDB     BIT
7DFF 5C              01420         INCB
7E00 F7    7FFB      01430         STB     BIT+1
7E03 34    02        01440         PSHS    A
7E05 CC    F800      01450         LDD     #$F800
7E08 8A    08        01460         ORA     #$8
7E0A FD    7FF8      01470         STD     MASK
7E0D 35    02        01480         PULS    A
7E0F C6    FF        01490         LDB     #$FF
7E11 7A    7FFB      01500 BITTST  DEC     BIT+1
7E14 27    0E        01510         BEQ     SAVE
7E16 1A    01        01520         ORCC    #$1
7E18 46              01530         RORA
7E19 56              01540         RORB
7E1A 1C    FE        01550         ANDCC   #$FE
7E1C 76    7FF8      01560         ROR     MASK
```

```
7E1F 76    7FF9      01570         ROR     MASK+1
7E22 20    ED        01580         BRA     BITTST
7E24 34    06        01590 SAVE    PSHS    D
7E26 FC    7FF8      01600         LDD     MASK
7E29 AA    84        01610         ORA     ,X
7E2B EA    01        01620         ORB     1,X
7E2D A7    84        01630         STA     ,X
7E2F E7    01        01640         STB     1,X
7E31 35    06        01650         PULS    D
7E33 A4    84        01660         ANDA    ,X
7E35 E4    01        01670         ANDB    1,X
7E37 ED    84        01680         STD     ,X
7E39 30    88 20     01690         LEAX    32,X
7E3C 39              01700         RTS
7E3D F6    7FFA      01710 FORW    LDB     BIT
7E40 CB    05        01720         ADDB    #5
7E42 C1    07        01730         CMPB    #7
7E44 23    04        01740         BLS     BITSV
7E46 30    01        01750         LEAX    1,X
7E48 C0    08        01760         SUBB    #8
7E4A C1    07        01770 BITSV   CMPB    #7
7E4C 26    0F        01780         BNE     BITDN1
7E4E 1E    10        01790         EXG     X,D
7E50 C1    1F        01800         CMPB    #$1F
7E52 26    07        01810         BNE     BITDN
7E54 4C              01820         INCA
7E55 5F              01830         CLRB
7E56 1E    01        01840         EXG     D,X
7E58 5F              01850         CLRB
7E59 20    02        01860         BRA     BITDN1
7E5B 1E    01        01870 BITDN   EXG     D,X
7E5D F7    7FFA      01880 BITDN1  STB     BIT
7E60 BF    7FFC      01890         STX     POS
7E63 39              01900         RTS
7E64 34    04        01910 BACK    PSHS    B
7E66 F6    7FFA      01920         LDB     BIT
7E69 BE    7FFC      01930         LDX     POS
7E6C C0    05        01940         SUBB    #5
7E6E 2A    14        01950         BPL     BACKSP
7E70 CB    08        01960         ADDB    #8
7E72 30    1F        01970         LEAX    -1,X
7E74 1E    10        01980         EXG     X,D
7E76 C1    FF        01990         CMPB    #$FF
7E78 26    08        02000         BNE     BACKS1
7E7A C6    1F        02010         LDB     #$1F
7E7C 1E    10        02020         EXG     X,D
7E7E C6    02        02030         LDB     #2
7E80 20    02        02040         BRA     BACKSP
7E82 1E    10        02050 BACKS1  EXG     X,D
7E84 BF    7FFC      02060 BACKSP  STX     POS
7E87 F7    7FFA      02070         STB     BIT
```

```
7E8A 35   84     02080         PULS   B,PC
7E8C      FFFF   02090 TABLE   FDB    $FFFF
7E8E      FFFF   02100         FDB    $FFFF
7E90      DDDD   02110         FDB    $DDDD
7E92      DFDF   02120         FDB    $DFDF
7E94      55FF   02130         FDB    $55FF
7E96      FFFF   02140         FDB    $FFFF
7E98      9909   02150         FDB    $9909
7E9A      099F   02160         FDB    $099F
7E9C      B17B   02170         FDB    $B17B
7E9E      D1BF   02180         FDB    $D1BF
7EA0      F32D   02190         FDB    $F32D
7EA2      B4CF   02200         FDB    $B4CF
7EA4      B55B   02210         FDB    $B55B
7EA6      25AF   02220         FDB    $25AF
7EA8      DBFF   02230         FDB    $DBFF
7EAA      FFFF   02240         FDB    $FFFF
7EAC      DB77   02250         FDB    $DB77
7EAE      7BDF   02260         FDB    $7BDF
7EB0      BDEE   02270         FDB    $BDEE
7EB2      EDBF   02280         FDB    $EDBF
7EB4      F690   02290         FDB    $F690
7EB6      96FF   02300         FDB    $96FF
7EB8      FBB1   02310         FDB    $FBB1
7EBA      BBFF   02320         FDB    $BBFF
7EBC      FFFF   02330         FDB    $FFFF
7EBE      9DBF   02340         FDB    $9DBF
7EC0      FFF0   02350         FDB    $FFF0
7EC2      FFFF   02360         FDB    $FFFF
7EC4      FFFF   02370         FDB    $FFFF
7EC6      FDDF   02380         FDB    $FDDF
7EC8      FDDB   02390         FDB    $FDDB
7ECA      B77F   02400         FDB    $B77F
7ECC      9640   02410         FDB    $9640
7ECE      269F   02420         FDB    $269F
7ED0      D9DD   02430         FDB    $D9DD
7ED2      DD8F   02440         FDB    $DD8F
7ED4      96ED   02450         FDB    $96ED
7ED6      B70F   02460         FDB    $B70F
7ED8      96E9   02470         FDB    $96E9
7EDA      E69F   02480         FDB    $E69F
7EDC      D950   02490         FDB    $D950
7EDE      DDDF   02500         FDB    $DDDF
7EE0      071E   02510         FDB    $071E
7EE2      E69F   02520         FDB    $E69F
7EE4      DB71   02530         FDB    $DB71
7EE6      669F   02540         FDB    $669F
7EE8      0EED   02550         FDB    $0EED
7EEA      B77F   02560         FDB    $B77F
7EEC      9669   02570         FDB    $9669
7EEE      669F   02580         FDB    $669F
7EF0      9668   02590         FDB    $9668
7EF2      EDBF   02600         FDB    $EDBF
7EF4      FDDF   02610         FDB    $FDDF
7EF6      DDFF   02620         FDB    $DDFF
7EF8      FDDF   02630         FDB    $FDDF
7EFA      DDBF   02640         FDB    $DDBF
7EFC      EDB7   02650         FDB    $EDB7
7EFE      BDEF   02660         FDB    $BDEF
7F00      FF0F   02670         FDB    $FF0F
7F02      0FFF   02680         FDB    $0FFF
7F04      7BDE   02690         FDB    $7BDE
7F06      DB7F   02700         FDB    $DB7F
7F08      96ED   02710         FDB    $96ED
7F0A      BFBF   02720         FDB    $BFBF
7F0C      9642   02730         FDB    $9642
7F0E      478F   02740         FDB    $478F
7F10      9660   02750         FDB    $9660
7F12      666F   02760         FDB    $666F
7F14      3551   02770         FDB    $3551
7F16      661F   02780         FDB    $661F
7F18      9677   02790         FDB    $9677
7F1A      769F   02800         FDB    $769F
7F1C      1AAA   02810         FDB    $1AAA
7F1E      AA1F   02820         FDB    $AA1F
7F20      0771   02830         FDB    $0771
7F22      770F   02840         FDB    $770F
7F24      0771   02850         FDB    $0771
7F26      777F   02860         FDB    $777F
7F28      9674   02870         FDB    $9674
7F2A      669F   02880         FDB    $669F
7F2C      6660   02890         FDB    $6660
7F2E      666F   02900         FDB    $666F
7F30      8DDD   02910         FDB    $8DDD
7F32      DD8F   02920         FDB    $DD8F
7F34      CEEE   02930         FDB    $CEEE
7F36      E69F   02940         FDB    $E69F
7F38      6533   02950         FDB    $6533
7F3A      356F   02960         FDB    $356F
7F3C      7777   02970         FDB    $7777
7F3E      770F   02980         FDB    $770F
7F40      6006   02990         FDB    $6006
7F42      666F   03000         FDB    $666F
7F44      6224   03010         FDB    $6224
7F46      446F   03020         FDB    $446F
7F48      9666   03030         FDB    $9666
7F4A      669F   03040         FDB    $669F
7F4C      1661   03050         FDB    $1661
7F4E      777F   03060         FDB    $777F
7F50      9666   03070         FDB    $9666
7F52      25AF   03080         FDB    $25AF
7F54      1661   03090         FDB    $1661
```

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```
7F56    356F    03100           FDB     $356F
7F58    9679    03110           FDB     $9679
7F5A    E69F    03120           FDB     $E69F
7F5C    0DDD    03130           FDB     $0DDD
7F5E    DDDF    03140           FDB     $DDDF
7F60    6666    03150           FDB     $6666
7F62    669F    03160           FDB     $669F
7F64    6666    03170           FDB     $6666
7F66    699F    03180           FDB     $699F
7F68    6666    03190           FDB     $6666
7F6A    006F    03200           FDB     $006F
7F6C    6699    03210           FDB     $6699
7F6E    966F    03220           FDB     $966F
7F70    6660    03230           FDB     $6660
7F72    DDDF    03240           FDB     $DDDF
7F74    0EC9    03250           FDB     $0EC9
7F76    370F    03260           FDB     $370F
7F78    8BBB    03270           FDB     $8BBB
7F7A    BB8F    03280           FDB     $BB8F
7F7C    F77B    03290           FDB     $F77B
7F7E    BDDF    03300           FDB     $BDDF
7F80    1DDD    03310           FDB     $1DDD
7F82    DD1F    03320           FDB     $DD1F
7F84    B55F    03330           FDB     $B55F
7F86    FFFF    03340           FDB     $FFFF
7F88    FFFF    03350           FDB     $FFFF
7F8A    FF0F    03360           FDB     $FF0F
7F8C    BDFF    03370           FDB     $BDFF
7F8E    FFFF    03380           FDB     $FFFF
7F90    FF1E    03390           FDB     $FF1E
7F92    868F    03400           FDB     $868F
7F94    7771    03410           FDB     $7771
7F96    661F    03420           FDB     $661F
7F98    FF87    03430           FDB     $FF87
7F9A    778F    03440           FDB     $778F
7F9C    EEE8    03450           FDB     $EEE8
7F9E    668F    03460           FDB     $668F
7FA0    FF96    03470           FDB     $FF96
7FA2    079F    03480           FDB     $079F
7FA4    DAB1    03490           FDB     $DAB1
7FA6    BBBF    03500           FDB     $BBBF
7FA8    F966    03510           FDB     $F966
7FAA    8E8F    03520           FDB     $8E8F
7FAC    7716    03530           FDB     $7716
```

```
7FAE    666F    03540           FDB     $666F
7FB0    DF9D    03550           FDB     $DF9D
7FB2    DD8F    03560           FDB     $DD8F
7FB4    EFEE    03570           FDB     $EFEE
7FB6    E69F    03580           FDB     $E69F
7FB8    F764    03590           FDB     $F764
7FBA    166F    03600           FDB     $166F
7FBC    3BBB    03610           FDB     $3BBB
7FBE    BB1F    03620           FDB     $BB1F
7FC0    FF60    03630           FDB     $FF60
7FC2    666F    03640           FDB     $666F
7FC4    FF16    03650           FDB     $FF16
7FC6    666F    03660           FDB     $666F
7FC8    FF96    03670           FDB     $FF96
7FCA    669F    03680           FDB     $669F
7FCC    F166    03690           FDB     $F166
7FCE    177F    03700           FDB     $177F
7FD0    F866    03710           FDB     $F866
7FD2    8EEF    03720           FDB     $8EEF
7FD4    FF16    03730           FDB     $FF16
7FD6    777F    03740           FDB     $777F
7FD8    FF07    03750           FDB     $FF07
7FDA    0E0F    03760           FDB     $0E0F
7FDC    BB1B    03770           FDB     $BB1B
7FDE    BBBF    03780           FDB     $BBBF
7FE0    FF66    03790           FDB     $FF66
7FE2    669F    03800           FDB     $669F
7FE4    FF66    03810           FDB     $FF66
7FE6    699F    03820           FDB     $699F
7FE8    FF66    03830           FDB     $FF66
7FEA    606F    03840           FDB     $606F
7FEC    FF69    03850           FDB     $FF69
7FEE    966F    03860           FDB     $966F
7FF0    F666    03870           FDB     $F666
7FF2    8E9F    03880           FDB     $8E9F
7FF4    FF0E    03890           FDB     $FF0E
7FF6    DB0F    03900           FDB     $DB0F
7FF8            03910 MASK      RMB     2
7FFA            03920 BIT       RMB     2
7FFC            03930 POS       RMB     2
7FFE            03940 BYTE      RMB     1
7FFF            03950 PATFL     RMB     1
        0000    03960           END
00000 TOTAL ERRORS
```

Listing 2: (FIND)

```
0E00            00010           ORG     $E00
0E00 9E    19   00020 START     LDX     25      *GET BEGINNING OF BASIC PROGRAM
0E02 1F    12   00030 LOOP1     TFR     X,Y     *TRANSFERE TO REGISTER Y
0E04 A6    80   00040 LOOP      LDA     ,X+     *GET FIRST CHARACTER IN PROGRAM
0E06 81    87   00050           CMPA    #135    *IS IT A PRINT CODE?
0E08 27    0D   00060           BEQ     GOTONE  *YES, GO CHECK FOR @
0E0A 81    A4   00070           CMPA    #164    *IS IT TAB CODE?
0E0C 27    31   00080           BEQ     TAB     *YES, GO TO PRINT ROUTINE
0E0E AC    A4   00090 LOOP2     CMPX    ,Y      *ARE WE AT THE END OF CURRENT LINE?
0E10 25    F2   00100           BLO     LOOP    *NO, CHECK NEXT CHARACTER
0E12 AE    A4   00110           LDX     ,Y      *YES, GET NEXT LINE
0E14 26    EC   00120           BNE     LOOP1   *START LOOKING IN NEXT LINE
0E16 39         00130           RTS
0E17 A6    80   00140 GOTONE    LDA     ,X+     *GET FIRST CHARACTER AFTER PRINT CODE
0E19 81    40   00150           CMPA    #64     *IS IT @?
0E1B 26    F1   00160           BNE     LOOP2   *NO, GO BACK AND LOOK SOME MORE
0E1D EC    22   00170           LDD     2,Y     *YES, GET LINE NUMBER
0E1F 34    30   00180           PSHS    X,Y     *SAVE X AND Y TO STACK
0E21 BD    BDCC 00190           JSR     $BDCC   *PRINT LINE NUMBER TO SCREEN
0E24 8E    0E65 00200           LDX     #PR     *GET LOCATION OF CHARACTERS TO PRINT
```

```
0E27 8D    31          00210          BSR     TEXTOU    *GO TO PRINT ROUTINE
0E29 35    30          00220          PULS    X,Y       *RETURN X AND Y FROM STACK
0E2B A6    80          00230 READ     LDA     ,X+       *LOAD A WITH NUMBER TO PRINT
0E2D 81    2C          00240          CMPA    #',       *IS IT A COMMA
0E2F 27    06          00250          BEQ     TRAN      *YES, END OF NUMBER
0E31 AD    9F A002     00260          JSR     [$A002]   *PRINT CHARACTER IN A
0E35 20    F4          00270          BRA     READ      *GO GET NEXT CHARACTER
0E37 86    0D          00280 TRAN     LDA     #13       *LOAD A WITH A SPACE CHARACTER
0E39 AD    9F A002     00290          JSR     [$A002]   *GO PRINT A SPACE
0E3D 20    C5          00300          BRA     LOOP      *GO CHECK REST OF CURRENT LINE
0E3F EC    22          00310 TAB      LDD     2,Y       *GET LINE NUMBER
0E41 34    30          00320          PSHS    X,Y       *SAVE X AND Y TO STACK
0E43 BD    BDCC        00330          JSR     $BDCC     *PRINT LINE NUMBER
0E46 8E    0E6D        00340          LDX     #TA       *GET LOCATION OF TAB TEXT
0E49 8D    0F          00350          BSR     TEXTOU    *GO PRINT TAB
0E4B 35    30          00360          PULS    X,Y       *GET X AND Y FROM STACK
0E4D A6    80          00370 READ2    LDA     ,X+       *GET NEXT CHARACTER
0E4F 81    29          00380          CMPA    #')       *IS IT A RIGHT PAREN?
0E51 27    E4          00390          BEQ     TRAN      *YES, END OF NUMBER
0E53 AD    9F A002     00400          JSR     [$A002]   *NO, GO PRINT CHARACTER
0E57 20    F4          00410          BRA     READ2     *GET NEXT CHARACTER
0E59 39                00420 END      RTS
0E5A A6    80          00430 TEXTOU   LDA     ,X+       *LOAD CHARACTER TO PRINT
0E5C 27    06          00440          BEQ     TEXT1     *IF IT IS A 0 THEN QUIT
0E5E AD    9F A002     00450          JSR     [$A002]   *PRINT THE CHARACTER
0E62 20    F6          00460          BRA     TEXTOU    *GET NEXT CHARACTER
0E64 39                00470 TEXT1    RTS
0E65       20          00480 PR       FCC     / PRINT /
0E6C       00          00490          FCB     $0
0E6D       20          00500 TA       FCC     / TAB   /
0E74       00          00510          FCB     $0
           0000        00520          END
00000 TOTAL ERRORS
```

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RAINBOW WISHING WELL 16K

With or without a sound pack, this program can be a useful learning tool.

Let CoCo Talk You Into A Better Education

By Fred B. Scerbo
Rainbow Contributing Editor

(Editor's Note: If you have an idea for the "Wishing Well," submit it to Fred c/o THE RAINBOW. *Remember, keep your ideas specific, but don't forget that this is* BASIC. *All programs resulting from your wishes are for your use, but remain the property of the author.)*

After several months of fun and graphics, I thought it might be a good idea to get back into some practical programs for your Color Computer. I have been receiving some very practical suggestions lately which will take a little time to develop.

Recently, some readers have suggested I develop something to go along with the speech synthesizer program packs which are now available from a number of distributors, including Radio Shack. So, this month's "Wishing Well" offers an educational program which will put these voice programs to full use, while at the same time fulfilling a wish I received almost two years ago.

The result, *Talking Micro Math Lab*, with or without speech will prove to be a valuable tool to anyone who is interested in teaching youngsters fundamental addition and subtraction skills. Notice I said with or without speech. There are a number of reasons why I designed this program to be used without a sound pack, as well as with.

First, even though the voice packs which are now available are all of excellent quality, only a small percentage of the many CoCo users have actually purchased one. Therefore, I did not want to list a program which could only be used by a small percentage of people.

Secondly, until recently, I have not been an advocate of using "talking computers." I have always thought of them as something of a gimmick. Besides, as a teacher, I had visions of a classroom teacher competing with the voice of a computer for the attention of the students. Little did I dream how useful they can be for educational purposes, especially when they are used with a set of headphones. (No competition, either.)

Therefore, *Talking Micro Math Lab* is designed with three options: 1) a non-talking version, 2) using the new Radio Shack Speech-Sound Pak, and 3) using Spectrum Voice Pak, available from Spectrum Projects. (It might also work with some other brand voice packs, but at the time of this writing, I did not have access to those other brands. If their distributors can loan me their models, I may be able to make future talking programs in the "Wishing Well" compatible with most other versions, too!) Also, I will include instructions on how to adapt the non-talking version to the MC-10 with the memory expansion pack.

The following listing is designed to work in its non-talking version in 16K Color BASIC, in its Radio Shack Speech-Sound Pak version in 16K, or in its Spectrum version in 32K from tape or disk. I have tried to shrink the Spectrum version down to work in 16K, but it looks like the program is just a little too big to work with the machine language driver it requires. Hopefully, those of you with the Spectrum Voice Pak will have at least 32K.

Now, let's spend a little time looking into the background which led to this month's article.

The Wish

The wish which led to this program actually predates my interest in computer speech. In fact, granting the wish actually came more along the lines of performing a minor miracle. You see, the original *Micro Math Lab* was developed with a specific student of mine in mind. This student's name is Mark, and his story is very interesting, indeed.

(Fred Scerbo is a special needs instructor for the North Adams Public Schools. He holds a master's in education and published some of the first software available for the Color Computer through his software firm, Illustrated Memory Banks.)

Mark and his twin brother, Bobby, came to me as students over two years ago at the age of 17. They had been born with a serious birth defect which left them with somewhat limited abilities. In spite of these serious limitations, both have been an absolute joy to work with. They are the kind of students one gets a really good feeling about being able to help.

I knew what I was getting before Mark and Bobby arrived rather belatedly at the high school level. I had known both from the time they were born and knew how great a task their parents must have had in trying to work with teachers to educate both in the simplest of life skills. Just before receiving both boys, the family helped fill our high school staff in on what limited skills both had. I was told Bobby was actually quite good in math, while Mark could not even comprehend adding two plus two.

What I later found was that what one was strong in, the other was usually weak in. For example, Bobby could handle rather complicated multiplication and division, but was extremely sloppy in his writing or in something as simple as coloring a picture. Mark, on the other hand, could not add, but was extremely neat and precise at a task such as coloring or handwriting.

Fortunately, what the family did not tell me was their teachers of the last eight years had assured them Mark would *never* learn to add! In fact, they told them to give up!

After working with Mark for just a few days, it became painfully obvious how limited his math skills were. He had developed the habit of using a scrap paper to draw lines or checkmarks to count in adding a single digit addition problem. This made his work slow, with little recall when not using the lines. Ask him what '7' and '9' are, and he would not know!

Therefore, I started working on a colorful math program for the CoCo that would catch Mark's attention as well as slowly draw him away from using lines. If I could have the computer screen display colored blocks corresponding to the digits in a given problem, I could get him to count the blocks on the screen, and then relate the total to the visual image of the math problem.

The result of this effort was the original version of *Micro Math Lab*, which I put Mark to work on for two class periods a day. On the average, Mark could complete nearly one hundred problems in a 45-minute period. I'll get into how to use the program a little later.

What Were The Results?

Recently, I spoke with Mark's parents. I asked them if they had checked how well Mark was doing in his addition. Since we had just come back from summer vacation, I was not at all surprised they had not given him any busy work over the summer. I promised to send home some math sheets so they could watch Mark doing his math.

The problems I sent home were four-digit, two-number addition problems. To their astonishment, Mark was able to complete the sheet in just minutes with no errors and with no number lines! They called to ask how I did it. It was at this time they told me about the prediction from his previous teachers that Mark would never learn to add.

Since that time we have also worked on subtraction and money handling. Mark's parents are also ready to buy the boys their own CoCo to use at home, and as you can guess, some "Wishing Well" software will probably go along with it.

The program more than proved its worth. However, I have two dozen more students who are in the same condition as Mark was. (Remember, these are handicapped, special needs students.) They have started this comprehensive program using the *Micro Math Lab* to strengthen their addition and subtraction skills.

Since our department just purchased the Radio Shack Speech-Sound Pak, I decided to adapt the program to use the speech it could generate. As you can imagine, some of the students do get a little bored during a long stretch with the computer. The speech would help liven things up.

The Program

The final result is the program you see listed here. As I mentioned, I have made it usable with both Radio Shack's Speech-Sound Pak and the Spectrum Voice Pak. Let me take a moment to mention the difference between the two.

The voice produced by the Radio Shack Pak is a very clear, precise voice without any real inflection, which is not bad for the type of students I am working with. I find the voice quite pleasant, in fact. The Pak does not require a machine language program.

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It requires a few *PEEK*s and *POKE*s, which only make up a few lines in your program.

The Radio Shack program does have two drawbacks. First, it does not read numbers correctly. The number 1,278 would be pronounced "one two seven eight" rather than one-thousand two-hundred seventy-eight. This means strings must be saved to pronounce these numbers, which can be an obstruction in any talking math program. This program takes this into consideration and compensates for it.

Secondly, there is a heftier price of about $100, almost $30 to $40 more than others. If you don't like to have to load in machine language drivers, the extra price may be worth it.

I have found one other drawback, but this may be a quirk in my program pack or in my older CoCos. Every so often, the computer will only produce static instead of speech. This can be resolved by pressing the Reset button. As I said, this may only be something with my own copy, and it is not a serious problem.

Spectrum's version does require a machine language driver, but this driver lets you do much more than the Radio Shack version, such as save a glossary of frequently used words. It also pronounces long numbers in their correct verbal form. Add to this the lower price tag and you have speech at a reasonable price. The voice is a little more "stuffed nosed" than Radio Shack's, but some of my students like it better because it gives the computer a little personality.

Maybe this will help some of you who haven't gotten a voice pack decide which one to get. I like having both. With a little luck, I may get to report to you on the other brands later.

In writing the programs, I wrote strings identified as A$ to generate the speech. You will notice I used phonetic spellings of the words I want spoken to get exactly the type of speech I wanted.

This was especially necessary with numbers such as 10 through 19, which the Radio Shack version could not pronounce in their numeric form. These strings will work equally well with the Spectrum version, even though they are not necessary.

If you use the non-talking version, you will not have to worry about the program being totally silent. I have included SOUND commands that are ignored in the talking mode. I have found that SOUND commands disconnect the Radio Shack's Speech Pak for some reason. Therefore, a number of *IF/THEN* statements will prevent this from happening.

I have not included the machine language driver for the Spectrum version since I would assume if you have one, you must have the program. You can also load from either tape or disk, if you have a Multi-Pak Interface or Y-cable. Those who have the Spectrum Pak will be familiar with the loading techniques. Once the driver is loaded, it does not have to be reloaded for additional runs.

Using The Program

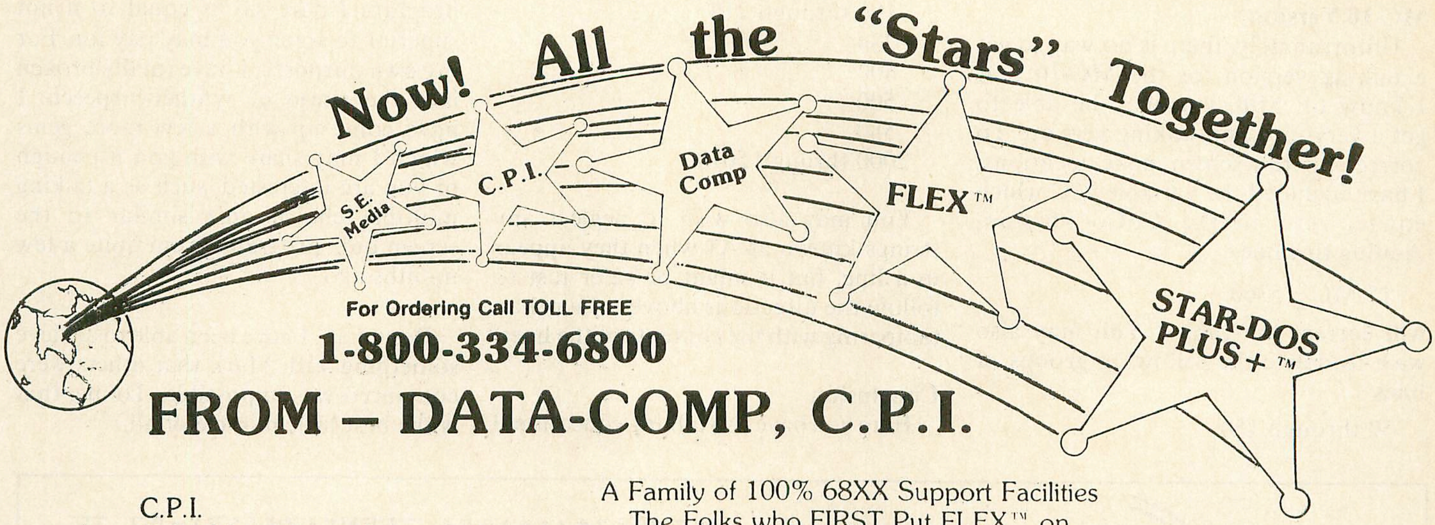
The first screen that appears will give you the three choices: A) non-talking, B) Radio Shack and C) Spectrum. Choose 'A,' and the program will proceed without sound. Press 'B,' and the proper values for the *POKE* will be used. Press 'C,' and the program will prompt you for tape or disk. Load the driver and the title card will appear.

If you use the non-talking mode, then the title TALKING will not appear. When in the talking mode, the title will be spoken. Press any key to go to your selections. You may next press 'S' for single digits or 'D' for double digits. Next, press 'A' for addition or 'S' for subtraction.

When your problems appear, you will notice the colored blocks to the right or left of each digit correspond by color and number to the digits in the problems. Therefore, the student can count the blocks to get an answer.

An arrow will point to the column being used. If an answer is 12, then the 2 must be entered first, and then the arrow will move to the next column. If any carrying is required, it will appear as a small carry number at the top of the next column. A green block will also be added for carrying purposes. If an error is made, then the program will make you continue until you get it right.

In the speaking versions, all responses and questions are actually spoken such as "How much is . . . ." or "No! The answer is not . . . " When you wish to see the number of correct answers and number of misses, press the '@' key, and this information will appear. Pressing ENTER will *reRUN* the entire program.



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MC-10 Version

Unfortunately, there is no way to get a talking version for the MC-10 that I know of. Still, you may be able to get a very nice non-talking version. To correct all the screen poke locations, I have included the variable MC which equals zero in the CoCo version. Adding this line:

15 MC=15360

will correct the values. You may also wish to delete the following groups of lines:

50 through 150
190 through 210
230
400
500
580
2000 through 5010

You may also wish to neglect any strings known as A$ when they appear in a line, but it might be safer just to follow the directions above rather than tampering with the contents of the lines.

Conclusion

Here you have it: a talking educational program I dare say is equal to if not superior to some you may pay for. For my own purposes, I have finally broken into the world of synthetic speech. I have come up with a few more gems which I may share with you if enough of you are interested, such as a talking multiple choice quiz similar to the screen quiz programs from quite a few months ago.

Best of all, I have been able to achieve something with Mark that others were convinced was impossible. To me, that is the best little miracle of all.

200	139	980	66
320	62	1160	236
410	194	1360	22
570	165	END	195
740	220		

The listing:

```
1 '*******************************
2 '*  TALKING MICRO MATH LAB    *
3 '*     BY FRED B. SCERBO      *
4 '*   COPYRIGHT  (C) 1984      *
5 '* 149 BARBOUR ST.N.ADAMS,MA *
6 '*******************************
10 CLEAR880
20 T=80:K=1:WJ$="PLUSS"
30 DIM Z$(19)
40 CLS
50 PRINT@132,"A) NON-TALKING VER
SION"
60 PRINT@196,"B) SPEECH-SOUND PA
K"
70 PRINT@260,"C) SPECTRUM VOICE
PAK"
80 X$=INKEY$:IFX$=""THEN80
90 IF X$="A"THEN VP=0:GOTO220
100 IF X$="B"THEN VP=1:GOTO130
110 IF X$="C"THEN VP=2:GOTO3000
120 GOTO80
130 XX=&HFF00:YY=&HFF7E
140 POKEXX+1,52:POKEXX+3,63
150 POKEXX+35,60
160 GOTO220
170 REM CREATE VOICE
180 IF VP=0 THEN RETURN
190 IF VP=1 THEN 2000
200 IF VP=2 THEN 4000
210 RETURN
220 REM START
230 Z$(10)="TEN":Z$(11)="ELEVVAN
":Z$(12)="TWELV":Z$(13)="THIRTEE
N":Z$(14)="4 TEEN":Z$(15)="FIFTE
EN":Z$(16)="6 TEEN":Z$(17)="7 TE
EN":Z$(18)="8 TEEN":Z$(19)="9 TE
EN"
240 R$=CHR$(128):Z$=CHR$(207):V$
=CHR$(204)
250 T$=CHR$(197):U$=R$+R$+R$+R$+
R$:UL$=R$+R$+R$:UV$=CHR$(199):UF
$=CHR$(175):UG$=CHR$(255)+CHR$(2
55)
260 YU$=CHR$(172):GOTO420
270 CLS0:PRINT@0,CHR$(255);:FORI
=1TO30:PRINT@I,CHR$(252);:NEXTI:
PRINTUG$;:PRINT@63,UG$;
280 PRINT@70,T$CHR$(203)R$UV$CHR
$(202)CHR$(196)Z$CHR$(200)R$Z$V$
V$R$Z$V$CHR$(203)R$Z$V$Z$U$UG$UL
$R$R$;
290 PRINTT$CHR$(202)Z$T$CHR$(202
)R$Z$R$R$Z$R$R$R$Z$V$CHR$(203)R$
Z$R$Z$U$UG$UL$R$R$CHR$(196);
300 PRINTCHR$(200)R$CHR$(196)CHR
$(200)CHR$(196)V$CHR$(200)R$V$V$
V$R$V$R$V$R$V$V$V$U$UG$;
310 PRINT@167,CHR$(165)CHR$(171)
R$CHR$(167)CHR$(170)R$CHR$(167)Y
U$CHR$(171)R$YU$UF$YU$R$UF$R$UF$
;
320 PRINT@191,UG$;
330 PRINT@199,CHR$(165)CHR$(170)
UF$CHR$(165)CHR$(170)R$UF$YU$UF$
R$R$UF$R$R$UF$YU$UF$;:PRINT@223,
UG$;
340 PRINT@231,CHR$(164)CHR$(168)
R$CHR$(164)CHR$(168)R$YU$R$YU$R$
R$YU$R$R$YU$R$YU$;:PRINT@255,UG$
;
350 PRINT@266,CHR$(191)R$R$R$CHR
$(183)CHR$(188)CHR$(187)R$CHR$(1
91)CHR$(188)CHR$(187);:PRINT@287
,UG$;
360 PRINT@298,CHR$(191)R$R$R$CHR
$(191)CHR$(188)CHR$(191)R$CHR$(1
91)CHR$(188)CHR$(187);:PRINT@319
,UG$;
370 PRINT@330,CHR$(188)CHR$(188)
CHR$(188)R$CHR$(188)R$CHR$(188)R
$CHR$(188)CHR$(188)CHR$(184);
380 PRINT@351,UG$;:FORI=1TO30:PR
INTCHR$(243);:NEXT:PRINTCHR$(255
);
390 IF VP=0 THEN RETURN
400 PRINT@66,CHR$(245)CHR$(252)C
HR$(250);:WW$="TALKING":FORWW=1T
O7:EW=ASC(MID$(WW$,WW,1)):PRINT@
WW*32+66,CHR$(245)CHR$(EW+32)CHR
$(250);: NEXTWW:PRINT@WW*32+66,C
HR$(245)CHR$(243)CHR$(250);:RETU
RN
410 A$="MY CRO.MATH.LAB":GOSUB17
0:RETURN
420 GOSUB270:GOSUB410:FORA=0TO9:
READ E,F,G:A$(A)=CHR$(E)+CHR$(F)
+CHR$(G):D$(A)=CHR$(E-T)+CHR$(F-
T)+CHR$(G-T)
430 READ E,F,G:B$(A)=CHR$(E)+CHR
$(F)+CHR$(G):E$(A)=CHR$(E-T)+CHR
$(F-T)+CHR$(G-T)
440 READ E,F,G:C$(A)=CHR$(E)+CHR
$(F)+CHR$(G):F$(A)=CHR$(E-T)+CHR
$(F-T)+CHR$(G-T):NEXTA
450 PRINT@417,"by"+R$+"fred"+R$+
"scerbo"+R$+R$+"copyright";:POKE
1467+MC,49:POKE1468+MC,57:POKE14
69+MC,56:POKE1470+MC,52
460 IFINKEY$=""THEN460
470 GOSUB270
480 PRINT@420,"s"+R$+"ingle"+R$+
"or"+R$+R$+"d"+R$+"ouble"+R$+"di
gits";
490 POKE1443+MC,40:POKE1445+MC,4
1:POKE1451+MC,32:POKE1454+MC,32:
POKE1455+MC,40:POKE1457+MC,41:PO
KE1463+MC,32
500 A$="PRESS S FOR SINGUL DIJJI
TS OR D FOR DUBBUL DIJJITS":GOSU
B170
510 X$=INKEY$:IFX$=""THEN510
520 IFX$="S"THEN560
530 IFX$="D"THEN550
540 GOTO510
550 D=2
560 PRINT@452,"a"+R$+"ddition"+R
$+"or"+R$+R$+"s"+R$+"ubtraction"
;
570 POKE1475+MC,40:POKE1477+MC,4
1:POKE1485+MC,32:POKE1488+MC,32:
POKE1489+MC,40:POKE1491+MC,41
580 A$="PRESS A FOR ADDITION OR
S FOR SUBTRACTION":GOSUB170
590 X$=INKEY$:IFX$=""THEN590
600 IFX$="A"THEN820
610 IFX$="S"THEN630
620 GOTO590
630 K=-1:WJ$="MY NUS":GOTO820
640 PRINT@P,A$(R);:PRINT@P+32,B$
(R);:PRINT@P+64,C$(R);:RETURN
650 PRINT@P,D$(R);:PRINT@P+32,E$
(R);:PRINT@P+64,F$(R);:RETURN
660 PRINT@AP,CHR$(209)CHR$(219);
:PRINT@AP+31,CHR$(209)CHR$(216)C
HR$(218)CHR$(217);
670 PRINT@AP+65,CHR$(218);:RETUR
N
680 PRINT@AP,R$R$R$;:PRINT@AP+31
,R$R$R$R$;:PRINT@AP+64,R$R$R$;:R
ETURN
690 FL=FL+1:A$="NO.THEE ANSWER I
S NOT "+X$:GOSUB170:FORHH=1TO600
:NEXTHH
700 IF VP=0 THEN SOUND40,2
710 RETURN
720 X$=INKEY$:IFX$=""THEN720
730 IFX$="@"THEN1250
740 X=ASC(X$)-48:IFX<0THEN720
750 IFX>9THEN720
760 RETURN
770 IF TB+(BB*K)>9 THEN X$=Z$(TB
+BB*K)+"CAIRY ONE"
780 IF X=TA+(BA*K)-(K*10) THEN X
$=Z$(X+10)
790 A$="CORRECT.THEE ANSWER IS "
+X$:GOSUB170
800 IF VP=0 THEN SOUND200,1:SOUN
D200,1
810 RETURN
820 CLS0:FORHH=1TO1600:NEXTHH:TA
=0:AT=AT+1
830 IFD=0THEN850
840 TA=RND(9):BA=RND(9):IFBA=>TA
 THEN840
850 TB=RND(10)-1:BB=RND(10)-1:IF
```

One-Liner Contest Winner . . .

This is one of the neatest pure graphics demo programs we've seen for the CoCo. It draws alternating lines all over the screen.

Alan Farmer
Charlottesville, VA

The listing:

```
0 PMODE4,1:PCLS:SCREEN1,1:Z=RND(
-TIMER):X=RND(251)+2:Y=RND(187)+
2:A=2:B=2:C=1:FORR=0TO1STEP0:LIN
E(X,Y)-(255-X,191-Y),PSET,B:X=X+
A:Y=Y+B:XG=(X<2ORX>253):YG=(Y<2O
RY>189):A=A*SGN(XG*2+1):B=B*SGN(
YG*2+1):IFXG ORYG THENC=1-C:COLO
RC:NEXTELSENEXT
```

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Simulations* and its companion *Rainbow Simulations Tape.*)

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Gemini: 10, 10X, 15, 15X (81/2 x 11 size only)
Radio Shack: LP7, LP8, DMP100, 110, 120, 200, 420, 510, 2100
Okidata: 92A - unless it is version 4. The ROM has a bug and the dealer should replace it for you.
Banana: Behaves like a Radio Shack
Prowriter: 8510

These type styles come on the CoCo Calligrapher program tape or disk:

Old English
Gay Nineties
Cartoon

Tape - $24.95
Disk - $29.95
Both require 32K ECB

These additional type styles are also available — **$19.95 each, or $49.95** for all on tape or disk.

Tape 1

Old English	Cartoon	Gay Nineties
Old English-reduced	Cartoon-reduced	Gay Nineties-reduced
Old English-reverse	Cartoon-reverse	Gay Nineties-reverse
Old English-reverse/reduced	Cartoon-reverse/reduced	Gay Nineties-reverse/reduced

Old English Cartoon Gay Nineties

Tape 2

Broadway
Broadway

Broadway
Broadway-reduced
Broadway-reverse
Broadway-reverse/reduced

Tape 3

Business
Business

Business
Business-reduced
Business-reverser
Business-reverse/reduced

Old Style
Old Style

Old Style
Old Style-reduced
Old Style-reverse
Old Style-reverse/reduced

Antique
Antique

Antique
Antique-reduced
Antique-reverse
Antique-reverse/reduced

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- Loads files 2 ways
- Kill file command
- Verifies tracks or entire disk
- Append sector command
- Transfers programs from tape to disk
- Rapid scan feature
- Dumps memory to screen
- Loads and executes rompacks saved on disk
- Move ROM to RAM command
- 64K compatible

Requires 32K - $34.95

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- Displays start, end, and execute addresses of ML programs
- Converts ML programs to Basic data statements
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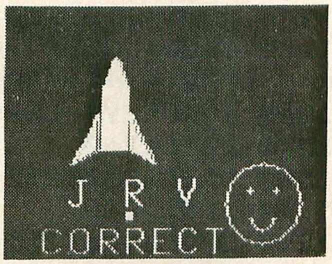
- Change memory in decimal or hex
- Rapid memory-scan using arrow keys
- Allows imput in hex or decimal
- Transfers control to other programs with a "go" command
- Moves blocks of memory from start through end address to new start address

Tape requires 16K ECB - $24.95
Disk requires 32K - $24.95

Sugar Software

PreReader

32K ECB; Joystick Required



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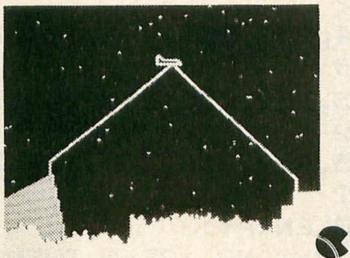
Level I - your child will work with colors, shapes, numbers, capital letters and small letters

Level II - your child will learn to associate individual letters and consonant blends with the sounds they make

Songs and happy faces for each correct answer!



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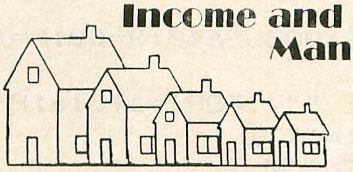

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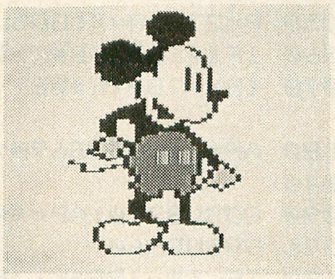

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```
BB=>TB THEN850
860 IFD=0THEN880
870 R=TA:P=44:GOSUB640:R=BA:P=14
0:GOSUB650
880 R=TB:P=48:GOSUB640:R=BB:P=14
4:GOSUB650
890 PRINT@231,"";:FORI=1TO16:PRI
NTCHR$(156);:NEXTI
900 IFK=-1THEN930
910 PRINT@168,CHR$(151)CHR$(155)
;:PRINT@200,CHR$(148)CHR$(152);
920 GOTO940
930 PRINT@168,CHR$(147)CHR$(147)
CHR$(146);
940 AP=400:GOSUB660
950 IFD=0THEN1000
960 IFTA=0THEN980
970 FORI=1TOTA:PRINT@1+I*32,CHR$
(252);:NEXT
980 IFBA=0THEN1000
990 FORI=1TOBA:PRINT@3+I*32,CHR$
(172);:NEXT
1000 IFTB=0THEN1020
1010 FORI=1TOTB:PRINT@30+I*32,CH
R$(252);:NEXT
1020 IFBB=0THEN1040
1030 FORI=1TOBB:PRINT@28+I*32,CH
R$(172);:NEXT
1040 A$="HOW MUCH IS "+STR$(TB)+
WJ$+STR$(BB):GOSUB170:GOSUB720
1050 P=272:R=X:GOSUB640
1060 IFX=TB+(BB*K)THEN1090
1070 IFX=TB+(K*BB)-(K*10)THEN109
0
1080 AP=P:GOSUB690:GOSUB680:GOTO
1040
1090 GOSUB770:AP=400:GOSUB680:AP
=396:GOSUB660
1100 IF TB+(BB*K)>9 THEN TB=0:BB
=0:POKE1036+MC,49:PRINT@1+32*TA,
CHR$(140);:A$="HOW MUCH IS ONE P
LUSS"+STR$(TA)+WJ$+STR$(BA):GOSU
B170:GOSUB720:TA=TA+1:GOTO1130
1110 IFTA=0THEN GOSUB680:GOTO124
0
1120 A$="HOW MUCH IS "+STR$(TA)+
WJ$+STR$(BA):GOSUB170:GOSUB720
1130 P=268:R=X:GOSUB640
1140 IFX=TA+(BA*K)THEN1170
1150 IFX=TA+(BA*K)-(K*10)THEN118
0
1160 AP=P:GOSUB690:GOSUB680:GOTO
1110
1170 GOSUB770:FORI=1TO2000:NEXT:
GOTO820
1180 GOSUB770:AP=396:GOSUB680:AP
=392:GOSUB660
1190 GOSUB720
1200 P=264:R=X:GOSUB640
1210 IFX=1THEN1230
1220 AP=P:GOSUB690:GOSUB680:GOTO
1190
1230 GOSUB770
1240 FORI=1TO2000:NEXT:GOTO820
1250 CLS0:GOSUB270:PRINT@419,"co
rrect"R$;AT-1;R$R$"misses"R$;FL;
1260 IFINKEY$=CHR$(13) THEN RUN
1270 GOTO1260
1280 DATA 247,252,251,255,240,25
5,244,252,248
1290 DATA 241,255,240,240,255,24
0,244,252,248
1300 DATA 254,252,251,243,252,24
1,252,252,252
1310 DATA 252,252,251,252,252,25
5,252,252,248
1320 DATA 255,245,250,252,253,25
4,240,244,248
1330 DATA 255,252,252,252,252,25
5,252,252,252
1340 DATA 255,252,252,255,252,25
5,252,252,252
1350 DATA 254,252,255,240,247,24
8,244,248,240
1360 DATA 255,252,255,255,252,25
5,252,252,252
1370 DATA 255,252,255,252,252,25
5,252,252,252
2000 FORI=1TOLEN(A$)
2010 IF PEEK(YY)AND 128=0 THEN20
10
2020 POKEYY,ASC(MID$(A$,I,1))
2030 NEXTI
2040 IFPEEK(YY)AND128=0THEN2040
2050 POKEYY,13
2060 FORHH=1TO900:NEXTHH:RETURN
3000 IF PEEK(&H6000)=&H7F AND PE
EK(&H6005)=&H20 THEN 220
3010 GOTO5000
3020 CLEAR1000,&H5FFF
3030 PRINT@327,"(D)ISK OR (T)APE
"
3040 X$=INKEY$:IFX$="D"THEN3050E
LSEIFX$="T"THEN3060ELSE3040
3050 CLS:PRINT@233,"PLEASE STAND
 BY";:LOADM"TRNSLATE":POKE&HFF40
,0:GOTO3070
3060 CLS:PRINT@233,"PLEASE STAND
 BY";:CLOADM"TRNSLATE"
3070 DEFUSR1=&H6000:DEFUSR2=&H60
05:DEFUSR3=&H6007
3080 T=80:K=1:WJ$="PLUSS":VP=2:D
IM Z$(19)
3090 GOTO220
4000 X$=USR2(A$)
4010 FORHH=1TO700:NEXTHH:RETURN
5000 PCLEAR1
5010 GOTO3020
```

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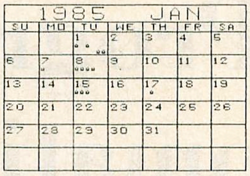

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		1	2	3	4	5
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13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

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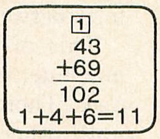

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Put Your Programs On 'Automatic'

By Jeffry Dwight

If you've been programming in machine language for a while, you probably have a stockpile of simple utility programs (like printer spoolers, the *Rainbow Check PLUS* program, or keyboard simplifiers) which you're constantly *LOADing*, *EXECing* and then forgetting about.

After awhile, one starts to look longingly at those packaged software programs which auto-*EXEC* themselves and wonder "Could I . . . ?" The answer is yes, you certainly can. There is a primitive means of copy "protection" which you (and some software companies) can use to make *any* ML program self-*EXEC* after loading.

It's done by means of the interrupt vectors. For those folks without an Editor-Assembler, sorry; you have to include it in the program during assembly. The following listing is called *AUTOBOOT* and relies on the fact that an ML program can have multiple origins. Simply substitute your own program, of whatever length, for the lines between MAIN and ENDIT.

This program will function on any machine, 4K through 32K, cassette or disk. There are three crucial things to note, otherwise the program may crash.

First, your ML program cannot rely on interrupts during execution — that is, your program is being inserted between an interrupt and its handling vector, so further interrupts will not occur until your program has finished execution.

Second, lines 58-60 must be the *very last* lines in your program. These lines change BASIC's normal procedures a bit, and must occur after the rest of the program has been successfully loaded.

Third, the only crucial origin is in Line 58 — the others may be changed to whatever suits your purposes. If you want to place the BOOT routine at the top of available memory, 32K users should change nothing. 16K users should make Line 44 read *ORG $3FDD* and 4K users must change it to *ORG $0FDD*.

Now, how it works. On startup, BASIC runs through a routine which puts values in a series of vectors, one of them being the "regular interrupt vector" which occurs approximately 60 times a second. BASIC then checks for Extended BASIC, and if it's present, transfers control. Extended BASIC changes those vectors, and passes control on to Disk BASIC, if it's there. All interrupts are masked (inoperative) during I/O — that's why Extended BASIC's timer stops — and reenabled immediately thereafter. If, during the loading process we change the vector, then the next interrupt will direct control to the new program.

Of course, the program must restore the old vector, and that's what lines 45 through 54 accomplish. These lines perform the same checks BASIC does to ascertain which vector is appropriate. This vector is then restored, but before we "clear" the interrupt and return control, we jump to the MAIN program.

The last thing the MAIN program does is reset BASIC's *EXEC* default (so you get an ?FC Error) and finish the interrupt process. And that's all there is to it. This technique will work with cassette or disk, and affords some degree of copy protection, though its main function is to save you a few keystrokes.

Tack the program's few lines onto the end of yours and assemble it as usual. Then, when you *CLOADM* (or *LOADM*) your program, it will boot itself. Note: If you are using Radio Shack's *EDTASM+*, you will produce a Bad Memory Error if you assemble

---

(Jeffry Dwight is the author of over 200 articles, programs, short stories and novels. His company, Jade Products in Chicago, specializes in the Color Computer and the IBM PC, producing general-use utilities and Adventure games.)

the program in memory. This is because *EDTASM+* will not assemble code "below" hexadecimal $600. Don't worry, the program will transfer to tape or disk perfectly well, and if you want to debug it in memory, use *A/IM/AO/NO* and *EDTASM+* will allow the procedure.

Obviously, this sort of program is not reentrant, and lines 40 and 41 ensure you do not *reEXEC* it accidentally. *EXECing* your program twice would cause the processor to reenter the interrupt handling routines when it shouldn't, and your computer would definitely "hang up" or crash. Use this technique for programs you load only once; reload to *reEXEC*.

The listing:

```
                    00010 **************************
                    00011 *                        *
                    00012 *  AUTOBOOT LOADER 1.0   *
                    00013 *                        *
                    00014 *  IF ADDED TO ANY M-L   *
                    00015 *   PROGRAM, IT WILL     *
                    00016 *  AUTOMATICALLY START   *
                    00017 *   THAT PROGRAM UPON    *
                    00018 *        LOADING.        *
                    00019 *                        *
                    00020 *   NOTE: INTERRUPT-     *
                    00021 * DRIVEN PROGRAMS CAN'T  *
                    00022 *  BE BOOTED THIS WAY.   *
                    00023 *                        *
                    00024 *     JEFFRY DWIGHT      *
                    00025 *     JADE PRODUCTS      *
                    00026 *  519 N. SCOTT STREET   *
                    00027 *  WHEATON, IL   60187   *
                    00028 *                        *
                    00029 **************************
                    00030
                    00031
5500                00032        ORG    $5500
5500                00033 MAIN   *
                    00034        *      START YOUR CODE HERE, OR AT
                    00035        *      WHATEVER ORIGIN YOU WANT.
                    00036        *
                    00037        *      REMEMBER TO HAVE A SINGLE EXIT
                    00038        *      POINT AT "ENDIT"
                    00039        *
5500 8E    B44A     00040 ENDIT  LDX    #$B44A          ?FC ERROR ADDRESS
5503 9F    9D       00041        STX    $9D             BASIC'S EXEC DEFAULT
5505 6E    9F 010D  00042        JMP    [$10D]          PATCH TO VECTOR
                    00043
7FDD                00044        ORG    $7FDD           START OF NEW VECTOR
7FDD 7F    FF40     00045 BOOT   CLR    $FF40           SHUT OFF DRIVES
7FE0 CE    D7BC     00046        LDU    #$D7BC          PREPARE DISK VECTOR
7FE3 BE    C000     00047        LDX    $C000           EXAMINE ROMS
7FE6 8C    444B     00048        CMPX   #$444B          DISK CONTROLLER?
7FE9 27    0E       00049        BEQ    BOOT1           IF YES, ALL DONE
7FEB CE    894C     00050        LDU    #$894C          PREPARE FOR ECB
7FEE BE    8000     00051        LDX    $8000           EXAMINE ROM
7FF1 8C    4558     00052        CMPX   #$4558          EXTENDED BASIC?
7FF4 27    03       00053        BEQ    BOOT1           IF YES, ALL DONE
7FF6 CE    A9B3     00054        LDU    #$A9B3          DEFAULT IS BASIC
7FF9 FF    010D     00055 BOOT1  STU    $10D            REPLACE ORIGINAL VECTOR
7FFC 6E    9F 009D  00056        JMP    [$9D]           JUMP TO MAIN PROGRAM
                    00057
010C                00058        ORG    $10C            CHANGE WHILE LOADING
010C 7E    7FDD     00059        JMP    BOOT            VECTOR TO BOOT PROGRAM
           5500     00060        END    MAIN            SET BASIC EXEC DEFAULT
00000 TOTAL ERRORS
```

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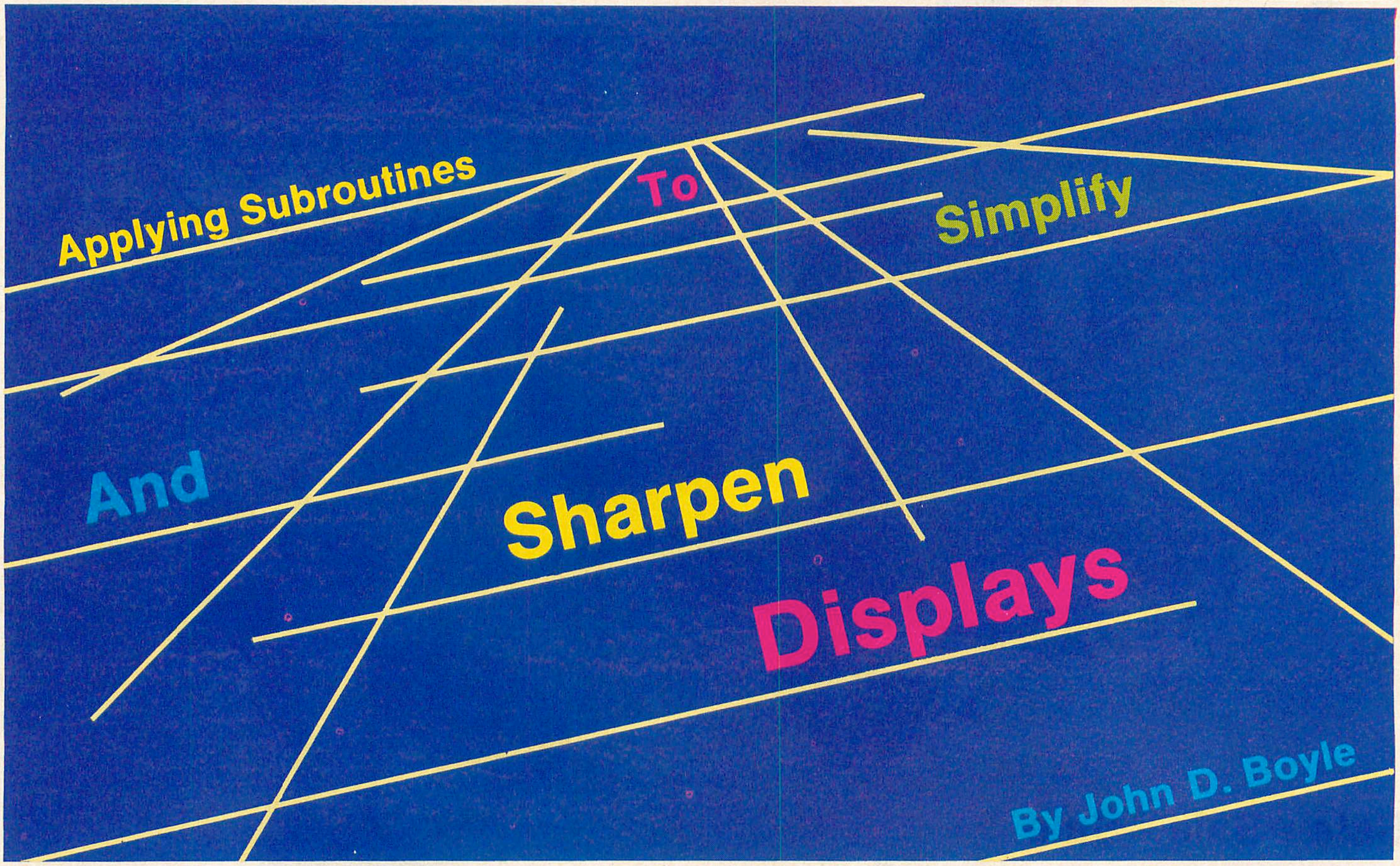

Applying Subroutines To Simplify And Sharpen Displays

By John D. Boyle

This article materialized out of a desire to simplify the writing of a program involving displays using the *PRINT@* function. It seemed there had to be an easier way to identify the location for printing than to count across the grid provided in the Radio Shack manuals. The answer was to use the math capability of the computer to do the calculation of the exact location. It's a lot easier to think of the screen in terms of 32 vertical lines (L) and 16 horizontal columns (C) than as 512 locations.

Therefore, this allows the use of the arithmetic capabilities of BASIC to write any location in the form 32 * L + C. As an example the statement

```
100 PRINT @ 5 * 32 + 8, A$
```

will print the string A$ at location 168. This may also be written as

```
100 L=5:C=8:PRINT@ L * 32 + C, A$
```

The advantages of this latter method (known as parameter passing) will become clearer as the more complex subroutines are developed later.

Experimenting with this revealed an apparent minor difficulty with the *PRINT @* statement. It works as described with text strings, but with numeric constants or the contents of variables it prints one location higher — that is, a statement

```
100 PRINT @ 0, 27
```

actually prints the value starting at Location 1 after putting a space at Location 0. The way around this is to write:

```
100 PRINT @ 0, RIGHT$ (STR$(27),2)
```

The *STR$* function converts the number to a string and the RIGHT$ (-,2) eliminates the space which BASIC prints before the numeric value.

Going beyond the earlier simple example, we can look at using some other functions which can automatically center messages in the given line. The number of characters in message A$ can easily be calculated by the statement:

```
200 M = LEN(A$)
```

Since we want half of these on each side of the center of the screen, we can find the starting location for the *PRINT* statement by subtracting ½M from the middle of the required line. Thus, the statement

```
300 PRINT @ 32 * L + 16 -M/2,A$
```

will center the message A$ in any given line 'L'. It is, of course, possible for there to be an odd number of characters in the message, resulting in an apparently invalid print location with a .5 additional value. However, BASIC ignores this and accepts the correct intended number.

Because of the number of statements and the frequency of use of the feature, it is convenient to make it into a subroutine.

```
100 CLS
110 M = LEN (A$)
120 PRINT @ 32 * L+16-M/2, A$
130 RETURN
```

The routine has two entry points. Line 100 is used if it is desired to clear the screen prior to printing, and 110 is used if not. Two parameters must be set up prior to calling the routine. These

---

(John Boyle holds an electrical engineering degree from Dundee in Scotland, and is currently working in a quality assurance position. He and his wife, Sheila, have two daughters.)

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are the messages which are equated to A$ and the line number which is stored in 'L'. Listing 1 illustrates the process of using the subroutine.

Note the extension from the version in the text. The statement L=L+1 has been added at the end of the routine. There is now no need to set up the line number for messages to be printed on the line following the last one used; it is already taken care of by the last call to the subroutine.

The only constraint is that messages must be 32 characters or less. The line number can be from 0 to 15. Note that if a 32 character message is employed, BASIC will blank the next line automatically. Also, if Line 15 is used, a single line scroll is generated. One further point is that all locations to the right of the start value in a *PRINT* @ statement are blanked, and only those needed for the following message or number are filled in. This can cause an apparent (and annoying) loss of data in a line if it is not understood.

The way around these three conditions is to use *POKE* statements instead of *PRINT* where needed.

While this simple centering technique adds considerably to displays with little extra programming effort, significantly more impact and professional appearance can be added to such displays as title blocks by extending it slightly. Two such possibilities are 1) to have the message typed out as if by a printer, and 2) to shift the message in from the right of the screen, halting in the center. These can both be accompanied by appropriate sounds.

The printer method involves putting up one character at a time with a short delay before the next one. The same subroutine technique is used. Looking at Listing 2, the length of the message is again calculated. It is used as before to determine the starting location for the *PRINT* @ statement in order to center the message. It is also used as the upper limit of 'X' in the *FOR/NEXT* loop to control the number of characters printed.

Since only one character at a time needs to be printed, a means of successively picking out the one ready to be displayed is needed. This is achieved by use of the *MID* function. The second parameter is 'X' and chooses the start of the characters to be displayed. The third parameter is one and is the number of characters printed each time.

In the *PRINT* location statement, 15 is used instead of 16 as the display column value, because 'X' is added in to move the print location to the right each time and it has a starting value of one. Delay and sound are staightforward.

The shift in message function is in Listing 3. In this case, successively longer portions of the message are displayed starting with the leftmost character at the extreme right of the screen. With 'X' as the second parameter in the *LEFT* function picking out one additional character each time, the message moves across the screen as the *PRINT* @ location pointer is decremented by 'X'.

The number of shifts made is 16 (to get to the screen center), plus one-half the number of characters in the message (in order to center it). This is controlled by the upper limit of the 'X' *FOR/NEXT* loop. Sound and speed are again included.

Listings 4 and 5 are variations of Listing 2, and are included to show what can be achieved by small changes in the routines.

Listing 6 shifts messages all the way across the screen until they disappear from the right. Note the two sections of the subroutine. The first takes care of moving the message onto the display; the second makes it vanish from the left side.

Listing 7 is somewhat different from the others in that it scrolls the messages from bottom to top of the screen. It makes use of the fact that if a *PRINT* @ statement is executed in the bottom line of the display, a single line upward scroll is generated automatically by BASIC. The messages are centered right to left as before.

Line 160 calculates the number of single line scrolls needed to center the display from top to bottom. This is set up by including the N = number of messages statement in the last message line only. 'N' should be set to zero in the first of any series of messages to be simultaneously displayed.

Enter and run these programs as they are to understand their operation, then change the messages to suit your own needs and include them in other programs. When using them in other situations, remember to place the subroutines (suitably renumbered) at the end of the program. This avoids the possibility of running the main program into the subroutine and the consequent need to *GOTO* around them.

Listing 1:

```
10 A$=CHR$(34)+"SELF CENTERING M
ESSAGES"+CHR$(34):L=5:GOSUB100
20 A$="BY":GOSUB110
30 A$="JOHN D.BOYLE":GOSUB110
40 A$="DATE:OCTOBER-1983":GOSUB1
10
50 END
```

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```
100 CLS
110 M=LEN(A$)
120 PRINT@32*L+16-M/2,A$
130 L=L+1
140 FORS=1TO200:NEXTS
150 RETURN
200 '
300 ' PROGRAM LISTING 1
```

Listing 2:

```
10 A$=CHR$(34)+"TITLE PRINTING R
OUTINE"+CHR$(34):L=5:GOSUB100
20 A$="BY":GOSUB110
30 A$="JOHN D.BOYLE":GOSUB110
40 A$="DATE:OCTOBER-1983":GOSUB1
10
50 END
100 CLS
110 M=LEN(A$)
120 FOR X=1TOM
130 PRINT@32*L+15-M/2+X,MID$(A$,
X,1)
140 SOUND100,1
150 NEXT X
160 L=L+1
170 SOUND 200,1
180 FOR S=1TO80:NEXTS
190 RETURN
200 '
300 'PROGRAM LISTING 2
```

Listing 3:

```
10 A$=CHR$(34)+"SHIFT IN TITLE R
OUTINE"+CHR$(34):L=6:GOSUB100
20 A$="BY":GOSUB110
30 A$="JOHN D.BOYLE":GOSUB110
40 A$="DATE:OCTOBER-1983":GOSUB1
10
50 END
100 CLS
110 M=LEN(A$)/2
120 FOR X=1TO16+M
130 PRINT@32*(L+1)-X,LEFT$(A$,X)
140 FORS=1TO20:NEXTS
150 SOUND100,1
160 NEXTX
170 L=L+1
180 FOR S=1TO90:NEXTS
190 RETURN
200 '
300 'PROGRAM LISTING 3
```

Listing 4:

```
10 A$=CHR$(34)+"REVERSE PRINTING
 ROUTINE"+CHR$(34):L=5:GOSUB100
```

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```
20 A$="BY":GOSUB110
30 A$="JOHN D.BOYLE":GOSUB110
40 A$="DATE:OCTOBER-1983":GOSUB1
10
50 END
100 CLS
110 M=LEN(A$)
120 FOR X=1TOM
130 PRINT@32*L+15+M/2-X,MID$(A$,
M+1-X,X)
140 SOUND100,1
150 NEXT X
160 SOUND 200,1
170 L=L+1
180 FORS=1TO90:NEXTS
190 RETURN
200 '
300 'PROGRAM LISTING 4
```

Listing 5:

```
10 A$=CHR$(34)+"PRINT MESSAGES B
ACKWARD"+CHR$(34):L=5:GOSUB100
20 A$="BY":GOSUB110
30 A$="JOHN D.BOYLE":GOSUB110
40 A$="DATE:OCTOBER-1983":GOSUB1
10
50 END
100 CLS
110 M=LEN(A$)
120 FOR X=1TOM
130 PRINT@32*L+15-M/2+X,MID$(A$,
M+1-X,1)
140 SOUND100,1
150 NEXT X
160 SOUND 200,1
170 L=L+1
180 FORS=1TO90:NEXTS
190 RETURN
200 '
300 'PROGRAM LISTING 5
```

Listing 6:

```
10 A$="READ RAINBOW MAGAZINE EAC
H MONTH":L=6:GOSUB 100
20 A$="THE BEST IN COCO INFORMAT
ION":GOSUB110
30 A$="DON'T BE WITHOUT IT":GOSU
B100
50 END
100 CLS
110 M=LEN(A$)
120 FOR X=1TO32
130 PRINT@32*(L+1)-X,LEFT$(A$,X)
140 FORS=1TO60:NEXTS
160 NEXTX
170 FORX=1TOM
180 PRINT@32*L,RIGHT$(A$,M-X)
190 FORS=1TO60:NEXTS
200 NEXTX
210 RETURN
220 '
300 'PROGRAM LISTING 6
```

Listing 7:

```
10 A$="SCROLLING CENTERING MESSA
GES":N=0:GOSUB100
20 A$="BY":GOSUB110
30 A$="JOHN D. BOYLE":GOSUB110
40 A$="DATE:OCTOBER 1983":N=4:GO
SUB110
50 GOTO50
100 CLS
110 M=LEN(A$)
120 PRINT@480+16-M/2,A$
130 IF N>0THEN160
140 FOR S=1TO150:NEXTS
150 RETURN
160 N=INT((15-N)/2)
170 FOR S=1TO150:NEXTS
180 IFN<1THENRETURN
190 N=N-1
200 PRINT@480," "
210 GOTO170
220 '
300 'PROGRAM LISTING 7
```

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EXPANDING ACCESS. Telebase Systems, Inc., of Narverth, Penn., has announced the introduction of a new retrieval service called "EasyNet" for personal computer and terminal owners. The service opens online searching to a whole new population of information users. EasyNet is sponsored by the National Federation of Abstracting and Information Services, the national professional association of database producers.

A single phone call placed to the toll-free number, 1-800-EASYNET (1-800-327-9637), connects anyone who uses a personal computer or terminal and modem to hundreds of databases offered by more than a half dozen major vendors, such as Dialog, BRS and NewsNet. Upon dialing, the caller is asked whether the search is to be billed against his/her Visa or MasterCard, or EasyNet account, and then led through a brief series of menu screens which determine the topic of interest. Prompted by the screen, a single keystroke directs EasyNet to select the most appropriate database for searching from the hundreds available through multiple vendors. The user need not know anything about databases; it is all automatic.

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* * *

COMPUTER TELECONFERENCE. A national video teleconference on "Educational Microcomputer Software: Identification, Evaluation, and Integration," will be broadcast via satellite from Oklahoma State University on April 13, 1985. The teleconference, to be coordinated by the OSU College of Education, will examine resources which are available to assist educators in identifying software for their subjects and grade levels, and in finding objective evaluations of the quality of that software. In addition, the teleconference will focus on ways in which educational microcomputer software can be integrated into the curriculum.

The teleconference will be broadcast from 12:30-4:30 p.m. EST, and will combine presentations by a panel of experts drawn from across the United States, demonstrations, videotapes of model classroom situations which illustrate the effective use and integration of microcomputer software, and two extended question-and-answer periods, during which questions from reception sites throughout the United States can be phoned into the studio and asked live on the air.

The teleconference will be available primarily through the institutions of higher education which are members of the National University Teleconference Network (NUTN). However, by special arrangement the teleconference can also be received by non-NUTN educational organizations, school districts, state departments of education, etc.

For a list of institutions scheduled to receive the teleconference or for additional details on the program as it is finalized, contact: Connie Lawry, Teleconference Coordinator, College of Education, Oklahoma State University, 108 Gundersen, Stillwater, OK 74078, (405) 624-6254.

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CLOSING THE GAP (CTG), internationally recognized resource authority on microcomputer applications for special needs populations, announced the publication of *Computer Technology for the Handicapped*, which is microcomputer applications written for special education and rehabilitation professionals, as well as handicapped individuals, their families and associates. The 260-page book focuses on how computer technology can help the handicapped or disabled person today. Topics include microcomputer applications in all disability areas: the hearing and speech impaired, the blind and vision impaired, and the physically and mentally handicapped.

Computer Technology for the Handicapped has been edited into an easy-to-understand format that allows everyone access to information which can enable handicapped and disabled persons to meet their everyday needs of education, communication, vocation, recreation and independent living.

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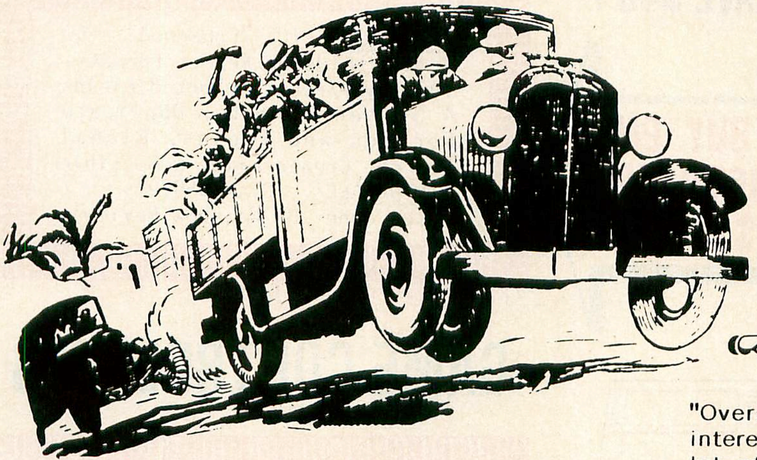

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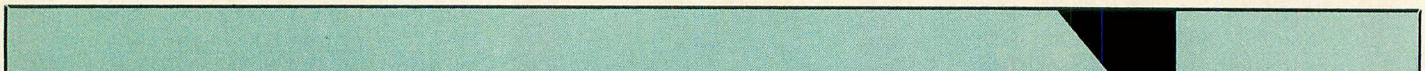
The printer can be used, but it is very slow and awkward.

After you *CLOAD* and *RUN* the program, simply key in the first number and hit the space bar, then hit one of the math function keys (no space bar needed here), and enter the second number and hit the space bar. The total will appear. Hit another math function key and the total becomes the top number, and you are ready to enter the second number.

The CLEAR key gets the user out of that set of calculations and readies the computer for a new one.

(Joel Robbins has been enjoying the Color Computer for about three years, and has published a number of his programs. He has a wife and two children, and teaches high school literature.)



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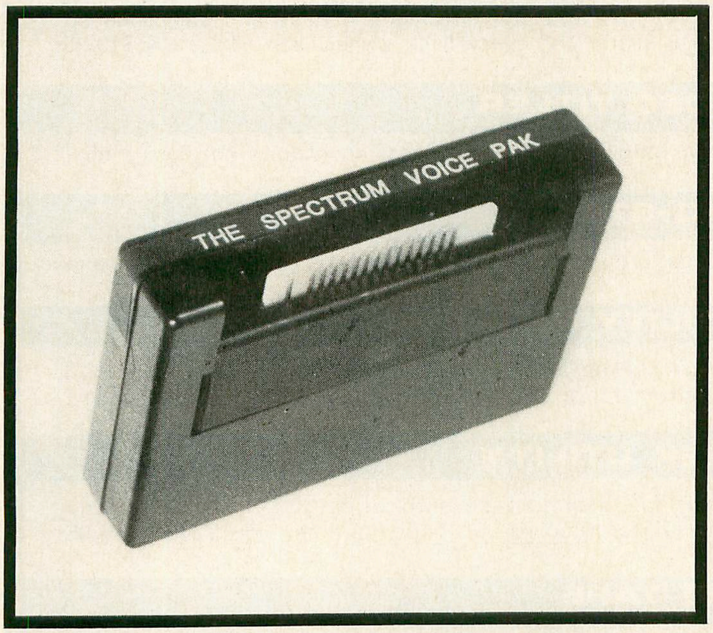

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```
22 .......238
47 .......182
END .....163
```

The listing:

```
1 'COCOPAD
2 'JOEL ROBBINS
3 'R#5, BOX 450
4 'SYRACUSE, IN   46567
5 CLS  ':POKE 65495,0'T0 SPEED
        UP DELETE FIRST
        APOSTROPHE
6 INPUT"DO YOU WANT A PRINT OUT(
Y/N)";PP$:IFPP$="Y"THENPP=1
7 SC$="12+34X67(34)999-345/12/15
(56-34)/45X23+17+16+77+34/"
8 PRINT SC$;SC$;SC$;SC$;SC$;SC$;
SC$;SC$;SC$;SC$;
9 POKE 1024+TW,175
10 TW=TW+1
11 IF TW>511THEN 14
12 GOTO 9
13 PRINT@145," ";:PRINT@JJ,"
            ";:PRINT@112,"
          ";:PRINT@199,"
        ";:CLEAR
14 JJ=112
15 PRINT@42," CALCULATOR ";
16 GOTO 18
17 IFN=1 THEN 40
18 A$=INKEY$
19 IF A$=""THEN18
20 IFPEEK(339)=191 THEN13
21 IF PEEK(345)=247 OR PEEK(338)
=191 THEN 34
22 IFA$="0"THEN32
23 IFA=7 ORA=8 OR A=9 THEN32
24 IFPEEK(339)=191THEN13
25 IF A$="U"THEN A$ = "4"
26 IF A$="I"THEN A$ = "5"
27 IF A$="O" THEN A$ = "6"
28 IF A$="L" THEN A$ = "3"
29 IF A$="K" THEN A$ = "2"
30 IF A$="J"THEN A$ = "1"
31 IFA$="1"ORA$="2"ORA$="3"ORA$=
"4"ORA$="5"ORA$="6"ORA$="7"ORA$=
"8"ORA$="9"ORA$="0"ORA$="."THEN3
2ELSE18
32 AA$=AA$+A$:PRINT@JJ,"
      ";:PRINT@JJ,AA$;
33 GOTO 18
34 IF N = 1 THEN 35ELSE36
35 C=VAL(AA$)
36 IF N=1 THEN 55
37 A=VAL(AA$)
38 IFPP=1 THEN PRINT#-2,,AA$
39 PRINT@145," ";
40 B$=INKEY$
41 IFB$=""THEN40
42 IFN=0 THEN45
43 PRINT@112," ":PRINT@112,"
   ";:PRINT@199,"
 ":PRINT@112,SUM;
44 IFPEEK(339)=191THEN13
45 IFB$="P"THENB$="X"
46 IFB$=";"THENB$="+"
47 PRINT@145,B$;
48 PRINT@176,"                    ";
49 IF PP=1 THEN PRINT#-2,,B$
50 IFB$="+"ORB$="X"ORB$="/"ORB$=
"-"THEN52ELSE39
51 M$=INKEY$:IFM$=CHR$(32)THEN52
ELSE51
52 N=1
53 AA$=" ":JJ=176
54 GOTO 18
55 IF PP=1THENPRINT#-2,,AA$
56 IFB$="+" GOSUB 64
57 IFB$="X" GOSUB 66
58 IFB$="/"GOSUB68
59 IFB$="-"GOSUB70
60 PRINT@199, "TOTAL =  " SUM;
61 IF PP= 1 THENPRINT#-2,"
 TOTAL",SUM
62 A=0:C=0:B$=""
63 GOTO17
64 SUM=SUM+A+C
65 RETURN
66 SUM=(SUM+A)*C
67 RETURN
68 SUM=(SUM+A)/C
69 RETURN
70 SUM=SUM+A-C
71 RETURN
```

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EXPANDING BASIC

32K DISK

Cooking With CoCo

PART VIII

By Colin J. Stearman

The last of the series where we 'burn' the EPROM and savor the delicacies we have been cooking up.

This issue sees the closing of the CoCo kitchen. We have added all the commands and features, and turned a good DOS into one which I hope you agree is even better. We have filled all the available space in the Disk BASIC ROM, and the only task left is to permanently place the modified DOS into an EPROM and install it in the controller.

Loading the EPROM

I covered how to transfer the modified DOS into an EPROM in Part 3 of the series in the September 1984 issue. But, here we are into 1985, so maybe we had better recap the procedure.

There are several ways to load the EPROM, so I will describe the one which is applicable to all configurations of CoCo. Before starting, you should assemble the entire patch file to a binary file in disk and call it *DISKPTCH.BIN*. Also, you should have a reliable blank cassette in the recorder.

The first step is to save the original Disk BASIC to a file on the tape. This is done with

```
CSAVEM"DBASIC",&HC000,
&HDFFF,&HA027
```

Now transfer the patch file to cassette. We will relocate the file during this process. Enter the following direct commands.

```
CLEAR 200,&H3FFF
LOADM"DISKPTCH",&H4000-
&HC000+65536
```

```
CSAVEM"DISKPTCH",&H4000,
&H5FFF,&HA027
```

Now disconnect the disk system and plug in the EPROM programmer. Don't forget to connect your 21-volt supply to the programmer. Rewind the tape and enter the following commands.

```
CLEAR 200,&H3FFF
CLOADM"DBASIC",&H4000-
&HC000+65536
```

```
CLOADM"DISKPTCH"
EXEC &HE000
```

The last command will start up the EPROM driver code in the EPROM in the programmer socket. If you haven't put it in an EPROM yet, then load it from tape, but make sure it does not conflict with the revised version of Disk BASIC temporarily resident at $4000 through $5FFF.

(Colin J. Stearman is an electronics engineer educated in the U.K. He has worked with all kinds of computers and has been a CoCo enthusiast for over two years.)

When the EPROM programmer is started up, load a 2764 EPROM into the ZIF socket and check that it is erased. Then transfer the memory contents from $4000 through $5FFF into the EPROM starting at EPROM address 0. This completes the programming. You can check the EPROM by powering down and moving the EPROM to the socket at address space $C000. When you power up, the revised Disk BASIC should start up, and CoCo will try to run *AUTOEXEC.BAS* from drive 0. As the disk controller is not plugged in, this will fail with a READ/WRITE ERROR. If you get this far the likelihood is that the EPROM is all right.

Loading The EPROM Into The Controller

Unfortunately, the 2764 does not have the same pin assignments as the ROM inside the disk controller. It doesn't even have the same number of pins. The ROM has 24, the EPROM has 28. To overcome this we must construct a conversion interface using a 28-pin IC socket.

The diagrams in Figure 1 show the overall approach. Obtain a good quality 28-pin IC socket, the solder type, not wire-wrap. Get the type with the pins oriented in the same plane as the IC pins, as shown in the figure. These pins have to enter to original ROM socket so they need to be this way. Some brands of socket have the pins at 90 degrees to the normal plane.

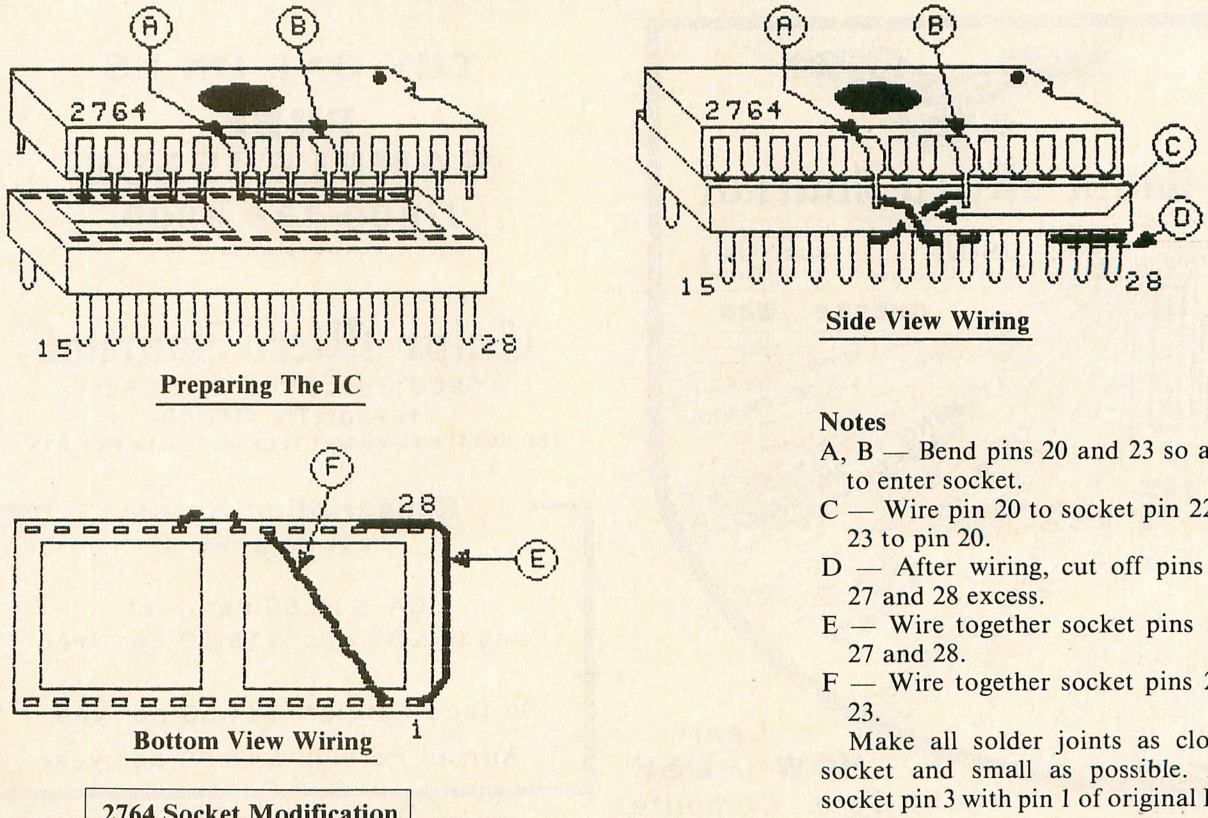
Take the EPROM and gently bend out pins 20 and 23 so they will not enter the socket, then press the EPROM home in the socket. Now run hookup wire from IC pin 20 to socket pin 22; IC pin 23 to socket pin 20; socket pin 23 to socket pin 2; and also interconnect socket pins 1, 26, 27 and 28. This should be clear from Figure 1. I suggest you use wire-wrap wire available from Radio Shack, as it is thin and strong. Make neat, small solder joints on the socket pins as these still have to go into the ROM socket in the controller. Cut off socket pins 1, 2, 27 and 28 close. Check all your connections carefully.

> ***"There are several ways to load the EPROM . . . Before starting, you should assemble the entire patch file to a binary file in disk and you should have a reliable blank cassette."***

You should now have a 28-pin IC plugged into a 28-pin socket with only 24 pins on it. These pins now correspond exactly to the pin functions of the ROM in the disk controller cartridge. To make the swap, you must open the controller cartridge. To do this peel back the metallic label, exposing a retaining screw. Remove this, then gently pry apart the two box halves. The Disk BASIC ROM is the only 24-pin IC in the unit. Gently lever the ROM out of the socket and replace it with the prepared EPROM. Pin 3 of the 2764 EPROM should be lined up with pin 1 of the socket. There is a small capacitor near the end of the socket and this could interfere with the conversion socket where it overhangs; gently bend it out of the way. Press the EPROM down firmly, replace the cover and screw, and press back the label.

The above instruction is for the older disk controller designed for the CoCo. If you have the newer CoCo your controller is probably different. However, it will also have the 24-pin ROM

Figure 1



Preparing The IC

Side View Wiring

Bottom View Wiring

2764 Socket Modification

Notes

A, B — Bend pins 20 and 23 so as not to enter socket.

C — Wire pin 20 to socket pin 22, pin 23 to pin 20.

D — After wiring, cut off pins 1, 2, 27 and 28 excess.

E — Wire together socket pins 1, 26, 27 and 28.

F — Wire together socket pins 2 and 23.

Make all solder joints as close to socket and small as possible. Align socket pin 3 with pin 1 of original ROM socket.

and should present no additional difficulty.

Now the acid test. Replace the controller cartridge and power up. The revised logo should appear, all drives should restore to track 0 and then drive 0 should whir, looking for *AUTOEXEC.BAS* to run. If you get that far you are "home and dry."

Fond Farewells

My enhancements have deliberately stayed within the 8K of the original Disk BASIC ROM, and if you have built the parallel port there are only a few bytes unused. There are many commands you might wish to add for yourself, and there is plenty of map space from $E000 to $FEFF available for this.

If you're running the 64K RAM version of the patch, you can use this space right now. If you went the EPROM route, maybe you could use the new 27128 EPROM or possibly piggyback two 2764s to receive the new commands. Either way, don't suffer with the limitations, do something to get rid of them!

If you intend transferring BASIC programs between a machine running *DECB 1.0* and another runnning *DECB 1.1,* some of the BASIC tokens will be different. This is due to the DOS command in *DECB 1.1*. Therefore, save the BASIC file as an ASCII file (use the ",A" after the *SAVE* command) and transfer will be successful. Of course, this is only needed if your program uses any of the new commands or functions.

> ***"There are many commands you might wish to add for yourself, and there is plenty of map space from $E000 to $FEFF available for this."***

I have greatly enjoyed cooking up this series and having you along to sample the treats these last eight months. I hope that you find my DOS enhancements useful and instructive, and they offer ways you can further personalize your CoCo.

If you would like the entire *DOS-PATCH* program source, along with binary files with and without the parallel port driver for *DECB 1.0* and *DECB 1.1,* just send me a disk (no cassettes please) along with $6 and a stamped, addressed disk mailer. I will load the disk and return it to you promptly.

I will program a 2764-250 EPROM with any reader-supplied code for $25, if you furnish the EPROM, and $35, if I do. The machine code to be programmed must be supplied in a CoCo binary file on disk. It can be put there with the *SAVEM* command. For example, to save the DOS use *SAVEM "DOS",&HC000,&HDFFF,0.* Indicate in a cover note the address range of memory saved this way. This file will be transferred to the EPROM starting at location 0 unless otherwise specified. Both disk and EPROM will be returned promptly. No other EPROM types will be programmed. EPROM contents are guaranteed to be the same as the file and nothing more.

Address this request or any questions to: Colin Stearman, 143 Ash Street, Hopkinton, MA 01748.

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How To Fix Your CoCo 2 Disk Controller

By Marty Goodman

Why bother to fix your own disk controller, when Tandy provides relatively inexpensive and readily available service for its products? First, if you fix a burned out part yourself, the part is back in service faster than any outside repair service . . . often within an hour. This can be valuable in a situation where you'd rather not be without your system for the few days to a week that it might take Tandy to make the repair. And, while Tandy's prices are reasonable, repairs made at home are even less costly.

Repair Procedure

(1) First make sure your Color Computer works when the disk controller is removed. Always remember to turn off the CoCo before you plug in or unplug your disk controller! Indeed, often the cause of a burned out controller is careless removal or insertion of it while the CoCo is turned on. If the CoCo works fine as an Extended BASIC CoCo with the disk controller out, but crashes on power up (shows either nothing at all or garbage on the screen) when the disk controller is plugged in, you can assume that the disk controller is damaged and must be repaired. If the system comes up with a normal-looking copyright notice for Disk Extended BASIC, but fails to read or write disks, be sure to try out the system with another disk drive unit, to determine whether the controller or the mechanical drive unit is at fault.

(2) Once you've established it's the controller that is the source of your problem, try this quick fix: with a pencil eraser, clean the contacts (called "lands") on the two edges of the disk controller until they're bright and shiny. If, after doing this, the system starts to work again, your problem was oxidation of the tin contacts. This can be permanently fixed by writing to EAP Corporation, and ordering their Gold Plug. Ask for the CoCo Disk Module. It costs $16.95 and is a solder-on package that supplies your disk controller with gold edge connectors. I've used this on several of my computers at home and find they work very well. I also advise using the gold plug on the Multi-Pak's edge card connector. The job of installing it does involve some degree (though not a great deal) of experience with fine soldering to printed circuits. The instructions provided by EAP Corp. are very clear.

(3) If dirty contacts is not the problem, your next step is to determine if the problem is limited to the three socketed chips. You do this by replacing these chips with known good replacements (which you can get from another working CoCo 2 disk controller). While it is remotely possible that your controller has a physical short on it that will burn out new chips put in it, this situation is *very* unlikely, and has never been reported. Generally speaking, you will not be likely to burn out a good chip by placing it in a blown disk controller.

If you've got garbage on the screen when you try to use the controller, first try replacing the Disk BASIC ROM (U1, a 24-pin DIP chip) with a known good ROM. If that doesn't fix the problem, try replacing the main disk controller (FDC) chip (U4, a 40-pin DIP Fujitsu MB8877A). If your problem is related to reading and writing on the disk, and is not fixed by replacing the 40-pin FDC chip, try replacing the auxiliary disk chip (U10, an 8-pin DIP Western Digital WD9216 chip).

If some or all of these chips are found to be bad, you may have to call Tandy's National Parts service in Fort Worth to obtain replacements. The Fujitsu

---

(Marty Goodman has, among many other things, been involved with various Color Computer software and hardware projects.)

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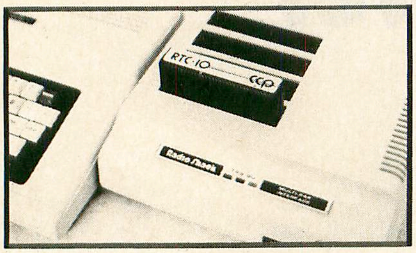

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MB8877A is also available through several IC parts houses as well (including DoKay Corp.), and several RAINBOW Magazine advertisers sell the ROM (Spectrum Projects and Vidtron). Unfortunately, I don't know where (other than through Tandy National Parts) to get that pesky little Western Digital WD9216. I'm sure it's available somewhere. If any of you out there know where, do write me and let me know!

(4) The odds are pretty good that, by now, you've fixed your controller. However, if the thing still won't read or write, it means that most likely you've blown one or more of the 12 ICs soldered to the board. As desoldering and replacing a soldered chip is a grand pain, it's helpful to have some guess at where the problem may lie, before you start ripping out *all* the chips!

If you are at this point and getting the normal Disk Extended BASIC copyright notice, but finding your controller fails to properly read from, or write to, a disk, then, very likely you have to replace one or both of two ICs. These are U11 (a 16-pin 74LS221) or chip U3 (a 14-pin 7416). NOTE: There are *two* 7416's on the board, U8 and U3. The one that is most likely to be blown is U3. This is obvious after a quick glance at the schematic for the CoCo 2 disk controller. U3 provides buffering on the outgoing NMI and HALT lines. These lines are right next to the + and - 12 volt lines on the edge connector. If you're using your CoCo 2 controller with an old CoCo or with a Multi-Pak, and jostle the controller while it's plugged in and the power is on, the 12 volts may get shorted into these two lines, burning out U3. I don't have a simple explanation as to why U11 seems to blow more often than other chips, though a friend who is a computer repair technician reports that the only time he's had to replace soldered ICs on the CoCo 2 controller it was U3 and/or U11.

Desoldering these chips is rather a tricky business. I found that because the chips tend to get soldered on both sides of the board (solder apparently oozes up during the wave-soldering process), I had to resort to cutting all the pins on the IC, then using a "solder sucker" (Radio Shack has one: Cat. No. 64-2098, $4.95) I cleaned out excess solder, and finally had to heat and individually pull out all the IC's severed pins. I have found that "solder wicks" (those copper braids for soaking up solder) are rather worthless for this sort of thing. However you do it, the process is usually tedious, even with a $200 super duper desoldering tool (though that tool *does* make the job noticeably easier). I have found in my lab that a Palladin brand desoldering tool (made in Sweden and costing about $15 at various electronic supply houses) meets all my desoldering needs nicely.

In any case, once you've removed (and destroyed) a given chip, replace it by first soldering in a corresponding IC *socket*. That way, should you blow out the controller again, the repair will be far simpler. Tandy really should have socketed at least some of those chips.

Final Comments

Of four controllers I've fixed over the last year, two required only cleaning the contacts. I later soldered on EAP Corp.'s gold plug to those, and the owners reported no further problems. One controller I bought in blown condition at a computer fair for $38. It turned out to have merely a blown Fujitsu MB8877A, which I replaced for $25 through DoKay Computer Products. Finally, one controller I was given recently by a friend. It turned out to require replacement of both U3 (7416) and U11 (74LS221).

I should make one curious observation. I do a lot of hardware experimentation with my systems. Often, this involves Y or extension cables running out from my CoCo or Multi-Pak. On several occasions, I've accidently plugged in the disk controller *upside down* into the CoCo's system bus. While it most certainly did not work when this was done, I was utterly amazed to discover that after powering down the system and turning the thing right side up, neither the disk controller nor the CoCo or Multi-Pak showed any sign of damage! Bob Rosen (founder of Spectrum Projects and supplier of 40-conductor extension and Y cables for very reasonable prices) apparently has had the same experience several times himself, and tells me he found the same thing. Neither of us recommend to readers that they try to duplicate our experiments in this matter!

Happy hacking!

(Address all correspondence to Marty Goodman, Cheshire Cat Computer Creations, P.O. Box 115, Lafayette, CA 94549)

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Analyzing More BASIC

By Richard White
Rainbow Contributing Editor

Though we published Rainbow Checkbook last month, there are a number of modules that have not been discussed in detail. I propose now to carry on that discussion partly for those who may be interested in the program itself. However, the larger purpose is to teach BASIC by studying code from working programs. I think it is better to deal with pieces from programs that have a reason on their own to exist, rather than made-up examples of little intrinsic worth.

The edit module of Rainbow Checkbook is a fairly large piece of program. Changing data is more complex than simply entering it. Existing subroutines are used whenever possible, but many of the edit functions are one time operations.

Edit was placed in the 200-299 line number block. I made no effort to maintain line numbers at intervals of 10, though I did shoot for five in this case. As it turned out, there are some lines with spacing of one.

This is going to be offensive to some, like the recent writer to THE RAINBOW who called for always numbering in increments of 10 starting at 100. He wanted to reserve the first 100 lines for his own headers and claimed that spacing lines at increments of 10 allows for easy modification.

Firstly, if there are to be headers, please put them at the end of the program where they don't waste prime program space. With the *RENUM* command available, you should feel free to number your programs any way you choose, since someone else can renumber the program if they wish.

Finally, short spacing of lines generally results from the original programmer having to make modifications to make the program work. I would *not* want the programmer to renumber a program for publication, for they would not then be able to easily answer questions about the program or otherwise support it.

Programs that are sequentially line-numbered in increments of one starting at zero use less memory. It takes fewer characters to identify lines in *GOSUB* and *GOTO* calls. Obviously, any module structure will be lost. It makes sense to renumber a program to increments of one to make a running copy, but keep a copy of your original source code for modification purposes.

When publishing a program, it is better to publish a source version rather than a compressed version, provided the source will run. In some cases, renumbering by ones may make a program fit a 16K machine. I am sure that 16K users would rather have a program they can run rather than a pretty one to look at.

```
50 PRINT@8,RC$,"ITEM  DATE     AMOUNT   BALANCE":
   RETURN
200 CLS:GOSUB50:PRINT@72,"UNEDITED ENTRY":
    PRINT@201,"EDITED ENTRY":PRINT@321,"TYPE
     FIELD ENTRY CORRECTION"," <enter> FOR
     NEXT FIELD":IFFG=1THENTF=1:FG=0
```

As always, the first order of business is what the screen is going to look like. We have a header in Line 50 which Line 20 calls. Then, the heading UNEDITED ENTRY is centered on the third line and the heading *EDITED ENTRY* is centered on the seventh. Edit is going to present one entry at a time under the UNEDITED ENTRY heading. As the user makes changes, the corrected record will unfold under the EDITED ENTRY heading.

Print position 321 is the second

(Richard White has a long background with microcomputers and specializes in BASIC programming. With Don Dollberg, he is the author of the TIMS *database management program.)*

position on Line 11. Here we present some instructions or reminders. FG is a flag that is set in the Input Module. If FG=1, we will hold that value in 'F' so we can use FG as a different flag in the Edit Module. I will have little to say about how FG works. Edit is confusing enough as it is.

```
210 I$=INKEY$:PS=96:GOSUB16:GOSUB15:
    PRINT@224,STRING$(95,32);:
    PRINT@416,"nEW #, dEP, aDJ, -=DELETE,
     +=ADDUP/DOWN ARROWS, rETURN   ";:
    PS=224:CT$=CC$:TA=CA
```

Have you ever hit a key twice instead of once and had a program bypass a sequence you needed? This can happen in BASIC when *INKEY$* is used, since the second keystroke is stored in a buffer and is available to the next *INKEY$* encountered. The *I$=INKEY$* in Line 210 clears the buffer of any inadvertant key strike.

Now we are going to print the unedited record starting at screen location 96. Subroutine 16 gets the fields of the record into variables and subroutine 15 prints the record starting at location PS. Any printing in the edited record area is wiped clean with *PRINT@224,STRING$(95,32);*.

Available options are printed starting on Line 14, print location 416. PS is set to 224 in preparation for printing the edited record, the check number string CC$ is temporarily assigned to CT$ and the amount CA temporily assigned to TA.

```
215 GOSUB1:IFI$=CHR$(13)THENPRINT@224,CC$;:
    GOTO240ELSEJ=INSTR(1,"NDA-+R"+CHR$(94)+
    CHR$(10),I$):ONJ GOSUB220,26,28,225,230,
    217,235,237
```

An instruction character is obtained from the *INKEY$* routine in Line 1. First, a check is made for the carriage return, *CHR$(13)*, which sends the routine in 240 after printing CC$. When I$ is not a carriage return, *INSTR* searches for a match for another instruction and returns a non-zero to 'J' when successful.

ON J GOSUB sorts out the proper subroutine line. Note that this is one of a number of applications for the *INSTR-ON . . . GOSUB* combination in the program. In terms of both memory usage and speed, this is preferable to a series of *IF . . . THEN . . . ELSE* statements which are the alternative.

```
216 IFFG=1THENFG=0:GOTO210ELSEIFI$<>"R"THEN
    GOTO240ELSEFG=TF
217 RETURN
```

If J=0 the program falls to 216. FG was set to zero on entering edit and edit expects it to be zero at Line 210, so if FG=1, it must be reset to zero. The program then goes to Line 210. If FG=0, the program will go to 240 to get the next field.

Now, the question is can the final element FG=TF ever be executed? Ha! A bug is found! This may explain some funny behavior I have seen on returning from edit. Let's change the lines as follows.

```
216 IFFG=1THENFG=0:GOTO210ELSE240
217 FG=TF:RETURN
```

We won't change the version number just yet. There are certain to be other changes for a while.

```
220 PRINT@224,"";:GOSUB1:VI=VAL(I$):GOSUB22:
    RETURN
```

Line 220 deals with changing the check number. In the *INPUT* mode, entry of a single digit signaled the program that a new number was being entered, rather than just inctementing the last check number.

Line 22 contains the code to get the remainder of the new check number, so we will use *GOSUB1* to get the first digit into I$ and use Line 22 to do the rest of the work. This routine, as well as those on lines 26 and 28 which enter DEP or ADJ rather than a check number, has been previously discussed.

```
225 FORX=CR TOLR-2:A$(X)=A$(X+1):A(X,0)=A(X+1,0):
    IFCC$<>"DEP"THENA(X,1)=A(X+1,1)+CA:
    CB=CB+CA ELSEA(X,1)=A(X+1,1)-CA:CB=CB-CA
227 NEXT:PRINT@96,STRING$(95,32);:CC$="":CD$="":
    CA=0:CS$="":CN$="ITEM DELETED":CR=CR-1:
    LR=LR-1:FG=1:RETURN
```

Lines 225 and 227 delete a transaction. This entails quite a bit of work, and is one of the tasks BASIC is not particularly fast at doing. All the data relative to all entries from the deleted member to the end of the file must be moved. In addition, all the balances for each of the affected members must be changed.

All the string data relative to a particular entry is kept in an array member A$(X). Transaction amounts are kept in the array A(X,0). Moving the data from the next array members down into the array spot of the deleted members, and then moving all succeeding array members down one to fill the resulting voids handles everything but the balance members.

This work is done in a *FOR . . . TO . . . NEXT* loop whose range is carefully chosen. LR is the number of the next transaction to be entered. LR-1 is the last transaction in the file. In the code *A$(X)=A$(X+1):A(X,0)=A(X+1,0)*, data from array locations X+1 is moved into array locations 'X'. When 'X' reaches LR-2, the last data in locations LR-1 is moved and that is where the loop must stop.

Balances must be increased if the deletion involved a check or adjustment, or reduced if a deposit is involved. The *IF . . . THEN . . . ELSE* code in 225 deals with this.

The *NEXT* must be in 227 so it will be operative iregardless of whether the balance was adjusted for a check or a deposit. The remainder of Line 227 does housekeeping, most important of which are decrementing the current record number CR and the last record number, LR.

```
230 CC$=" ":CD$=" ":CS$=" ":CA=0:TA=0:
    CN$="MAKE NEW ENTRY":FG=1:
    FORX=LRTOCR+1STEP-1:A$(X)=A$(X-1):
    A(X,0)=A(X-1,0):A(X,1)=A(X-1,1):NEXT:
    CB=A(X-1,1):LR=LR+1:GOSUB38
```

Line 230 manages the addition of a transaction to the file. First, it performs the opposite function done in delete. All records are moved up in the file to make room for the new record. Note that the *FOR . . . TO . . . NEXT* loop works from the top down, the last record is moved up, then the next to last, etc. Again, the end point needs some thought. Since the last record moved is numbered X-1, the loop must stop at CR+1. It is quite easy to get confused or simply overlook what is happening in data moves of this sort and end up moving too many or too few records.

Finally, the program goes to Line 38 which makes a new data string and fills the arrays. The only thing other than spaces in the string array member is the message "MAKE NEW ENTRY."

```
232 PS=96:GOSUB16:GOSUB15:PRINT@416,"nEW #, dEP,
     aDJ, -=DELETE":PRINTSTRING$(28,32);:
    PS=224:GOSUB1:FG=0:J=INSTR(1,"NDA-",I$):
    ONJ GOSUB220,26,28,225
234 IFJ>0THEN240ELSE232
```

In Line 232, the blank data we just put into the arrays is pulled back out and printed in the unedited space. This sends the user the message to edit the blank transaction to produce the new record. Command options are now limited to only those that pertain to the new record. The ability to scroll through the database is denied. Otherwise, our strategy is identical with Line 215.

```
235 FG=1:IFCR>1THENCR=CR-1:GOSUB16:PS=96:
    GOSUB15:PS=224:RETURNELSERETURN
237 FG=1:IFCR<LR-1THENCR=CR+1:GOSUB16:PS=96:
    GOSUB15:PS=224:RETURNELSERETURN
```

Lines 235 and 237 manage the scroll through the records, the print position of the unedited record and positioning of the cursor to edit the record. Scrolling is limited to the range of CR=1 to CR=LR-1. Here again, Line 16 takes the string data apart and Line 15 prints it.

```
240 PRINT@416,STRING$(45,32):GOSUB30:
    IFCT$="DEP"THENIFCC$="DEP"THENTA=CA-TA:
    GOTO242ELSETA=-TA-CA:GOTO242
241 IFCC$="DEP"THENTA=TA+CA ELSETA=TA-CA
```

Once the check number (or DEP or ADJ as the case may be) has been handled, Line 240 starts dealing with editing the rest of the record. The prompts at the bottom of the screen are cleared and Line 30 is called to get the date. Remember that CT$ and TA hold the original check number string and amount. Now a new TA is calculated. If CT$="DEP", TA is calculated one way if the entry is still a deposit, and another if it is not and the program control is handed to Line 242. The alternate situation, where CT$ was not "DEP", is handled in Line 241 where again there are two possibilities to be handled.

```
242 PRINT"TA"TA,"CA"CA;:FORX=1TO2000:NEXT:
    FORX=CR TOLR-1:A(X,1)=A(X,1)+TA:NEXT:
    CB=A(CR,1):PRINT@247,USINGSS$;CB;:
    LINEINPUTI$:IFI$<>""THENCS$=I$
```

The code that starts Line 242 is not a bug, it's an embarrassment. During program debugging, I had to know what CA and TA were. I put in code to print them and delay the program long enough for me to check the numbers. This is a good way to check out what is happening when you are unsure of the cause of a problem. Another way is to put a *STOP* in a line. This breaks the program and allows you to type in commands from the keyboard like *PRINT TA,CA*, then you can resume at the command after the *STOP* by typing *CONT.* Unfortunately, your screen formatting is destroyed in the process. Of course, any debugging code put in the program must be taken out. It's still not too late.

```
242 FORX=CR TOLR-1:A(X,1)=A(X,1)+TA:NEXT:
    CB=A(CR,1):PRINT@247,USINGSS$;CB;:
    LINEINPUTI$:IFI$<>""THENCS$=I$
```

That's better! Now the adjustment factor: TA is added to each balance from the current record, CR to the last record in the file LR-1. The new balance is printed and the status character obtained in I$. If no status character is entered, the one already assigned to CS$ is unchanged.

```
244 PRINT@256,USINGSN$;CS$;:LINEINPUTI$:
    IFI$<>""THENCN$=I$
246 PRINT@259,CN$:GOSUB38:GOTO210
```

Line 244 prints the status and looks for a new note. Line 246 prints the note, goes to Line 38 to reassemble the data string and then goes back to 210 for instructions on what to do next.

The complexity of edit lies in the variety of changes that must be supported, and the fact that some of these changes affect the balance in different ways. The problems are in the logic; once that is figured out, the code is fairly simple.

We were able to use many of the subroutines we developed for the input mode. This will follow naturally if you make some effort to keep your subroutines fairly general. For example, records are printed at two different places on the input screen and at a different place again on the edit screen. The format is identical in each case. The use of PS to identify a print start location lets us use fewer subroutines to handle a variety of needs.

Next month we will finish up the new month and printer routines, and prepare to move on to different programming challenges.

fss

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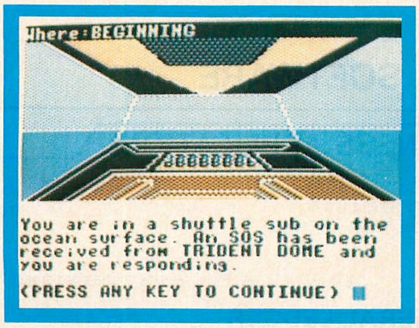
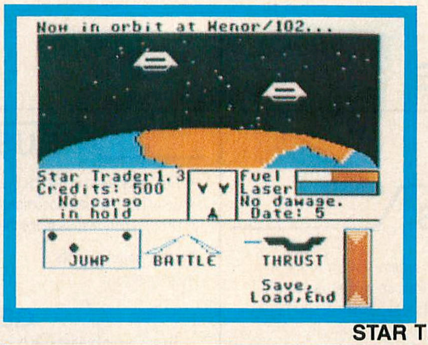


```
Where:BEGINNING

You are in a shuttle sub on the
ocean surface. An SOS has been
received from TRIDENT DOME and
you are responding.

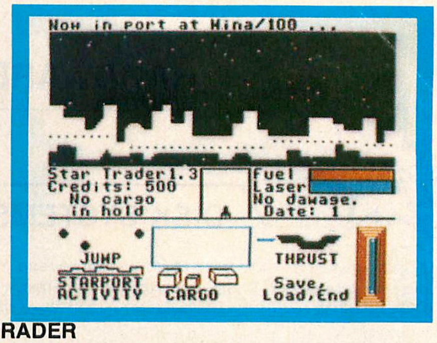
(PRESS ANY KEY TO CONTINUE)
```



```
Now in orbit at Wenor/102...

Star Trader1.3   Fuel
Credits: 500     Laser
 No cargo        No damage.
 in hold          Date: 5

 JUMP    BATTLE    THRUST
                   Save,
                   Load,End
```

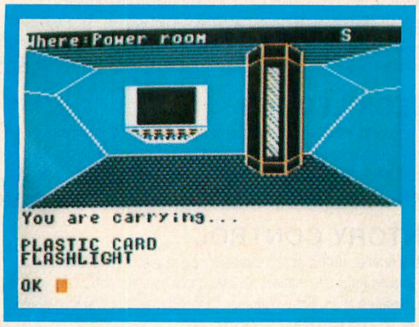


```
Now in port at Mina/100 ...

Star Trader1.3   Fuel
Credits: 500     Laser
 No cargo        No damage.
 in hold          Date: 1

 JUMP              THRUST
STARPORT           Save,
ACTIVITY  CARGO    Load,End
```

STAR TRADER

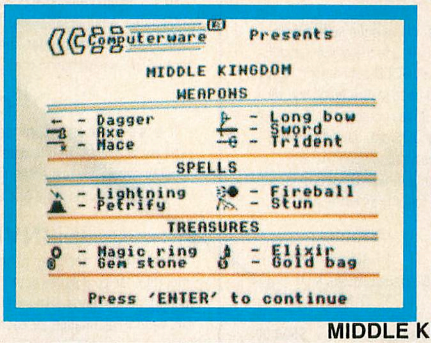


```
Where:Power room            S

You are carrying...

PLASTIC CARD
FLASHLIGHT

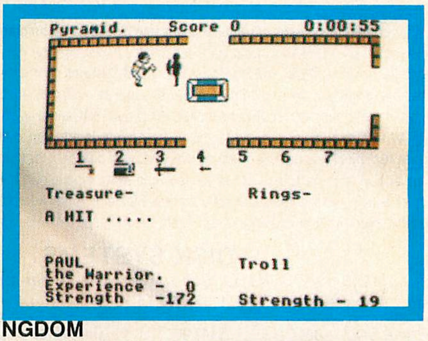
OK
```



```
Computerware  Presents

      MIDDLE KINGDOM
         WEAPONS
 - Dagger        - Long bow
 - Axe           - Sword
 - Mace          - Trident
          SPELLS
 - Lightning     - Fireball
 - Petrify       - Stun
        TREASURES
 - Magic ring    - Elixir
 - Gem stone     - Gold bag

  Press 'ENTER' to continue
```



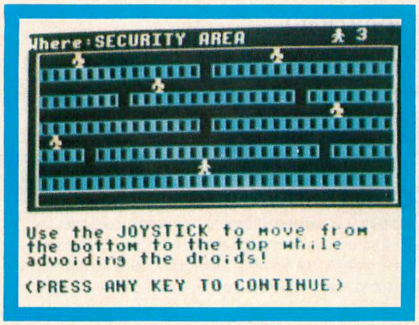
```
Pyramid.     Score 0      0:00:55

 1  2  3  4    5   6   7

Treasure-          Rings-
A HIT .....

PAUL               Troll
the Warrior.
Experience - 0
Strength   -172    Strength - 19
```

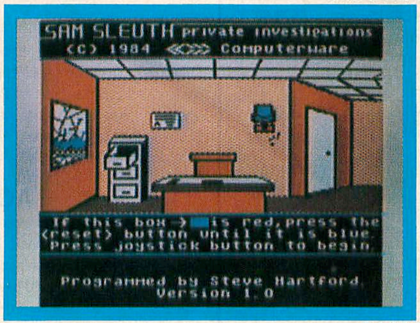
MIDDLE KINGDOM



```
Where:SECURITY AREA        3

Use the JOYSTICK to move from
the bottom to the top while
advoiding the droids!

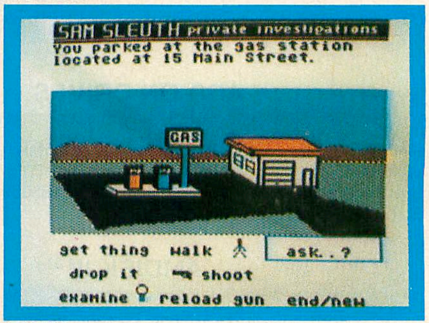
(PRESS ANY KEY TO CONTINUE)
```



```
SAM SLEUTH private investigations
  (C) 1984       Computerware

If this box -> is red,press the
(reset) button until it is blue.
Press joystick button to begin.

 Programmed by Steve Hartford
         Version 1.0
```



```
SAM SLEUTH private investigations
You parked at the gas station
located at 15 Main Street.

get thing    walk     ask..?
drop it      shoot
examine    reload gun   end/new
```

MAJOR ISTAR

SAM SLEUTH

MAJOR ISTAR

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How Not To Let The Bugs Bite In Your Cassette Merge Program

By John D. Boyle

There have been several articles on merging cassette-based programs in various CoCo magazines. All of these I have seen have a common bug which has the potential for bombing any attempted merges. The bug will appear in only 0.8 percent of the programs, and is a function of the length of the initial program.

Bug apart, there is an excellent introductory article on the merge procedure by John Nicolettos in the January 1983 *80 Micro*. Another good reference is "A Mixed Bag Of BASIC" in the August 1983 RAINBOW by Richard A. White.

The method operates by modifying the start of BASIC pointers contained in RAM locations 25 and 26 to be two less than the current end of BASIC pointers contained in RAM locations 27 and 28. This fools the BASIC loader into putting the second program behind the first. The subtraction of two is needed to eliminate the two locations used to identify end of program to the BASIC interpreter.

(John Boyle holds an electrical engineering degree from Dundee in Scotland, and is currently working in a quality assurance position. He and his wife, Sheila, have two daughters.)

The method described works as long as the value in 28 is two or higher. When 28 is one or zero, there is a need to borrow one from Location 27 and this capability is not included in the published programs. Since any single byte (eight-bit) location has 256 possible values for its contents, the problem can show up 2/256 or around 0.8 percent of the time.

The bug is relatively obvious to anyone who did assembly language programming for the 6800 (the 6809 predecessor). For those who started on the 6809 with its double precision (two-byte) instructions, the difficulty may be less clear. Compare the two assembly language programs shown in listings 1 and 2.

Listing 1: 6809 Assembly Code

```
LDD 27 get values in 27 & 28
SUBD #2 subtract 2 -borrow is automatic
STD 25 save result
```

Listing 2: 6800 Assembly Code

```
100 LDAB 28 fetch low byte
200 LDAA 27 fetch high byte
300 SUBB #2 subtract 2 from low byte
400 SBCA #0 take any borrow from high byte
500 STAB 26 save low byte
600 STAA 25 save high byte
```

The 6809 code is simpler and shorter because the 'D' instructions handle two bytes at once, and automatically take care of the borrow between the two bytes. The 6800 code requires one line to cater for the borrow possibility. Unfortunately, the *PEEK* and *POKE* capabilities of BASIC are like the 6800 in that they can only handle a single byte at a time. Hence, any attempt to carry out the double precision subtraction used in the merge procedure must build the capability for handling a borrow situation into the BASIC code.

Possibly the most elegant solution is to include the 6809 code shown above as a machine language subroutine. However, only BASIC solutions will be discussed in this article.

Listing 3 contains the simplest equivalent of the 6800 instructions in BASIC. The only real complexity comes in the determination of whether or not

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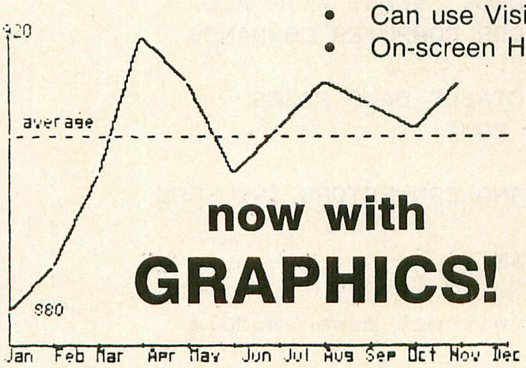

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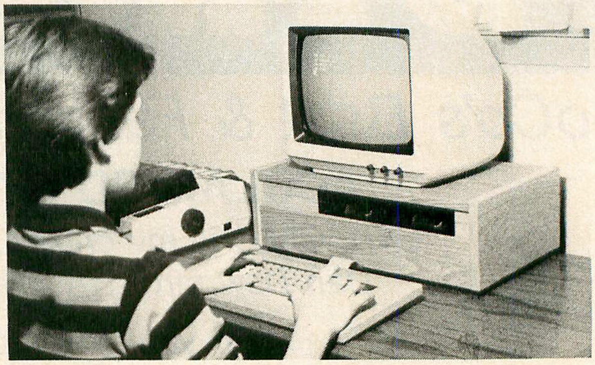

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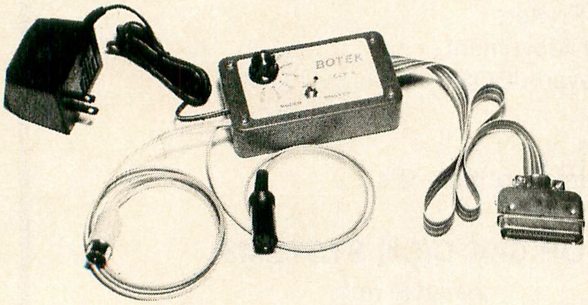

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313-739-2910 4949 HAMPSHIRE UTICA, MICHIGAN 48087 DEALER INQUIRIES INVITED a borrow occurred. This is done in Line 400. If FL is negative (less than zero), a borrow is needed from the upper byte. The lowest bit of the upper byte is worth 256. Therefore, when it is borrowed from FH, it is added to FL as 256. This is guaranteed to make FL positive and it can then be *POKED* into the answer location.

Listing 3: BASIC Program

```
100 FL=PEEK(28) fetch low byte
200 FH=PEEK(27) fetch high byte
300 FL=FL-2      subtract 2
400 IF FL>= 0 THEN 500  borrow  needed?
450 FH=FH-1:FL=FL+256 yes!
500 POKE 26.FL save low byte
600 POKE 25,FH save high byte
```

Other methods are possible. Listing 4 gives an example. Here, the two bytes are combined into one using the 256 factor between bytes by multiplying and adding. The subtraction is then carried out before separating the bytes, again using BASIC's divide and *INT* (integer) functions.

Listing 4: Alternate BASIC Program

```
100 FL=PEEK(28) fetch low byte
200 FH=PEEK(27) fetch high byte
300 FC=FH*256+FL combine bytes
400 FC=FC-2 subtract
500 FH=INT(FC/256):FL=FC-256*FH separate bytes
600 POKE 26,FL:POKE 25,FH
```

Why are alternates important? They are most commonly investigated to obtain the best solution in terms of either execution speed or memory usage, but another important reason is for test purposes.

By running a program such as shown in Listing 5, which directly compares the results of two alternate methods, it is possible to use the computer to exhaustively test routines like this one and avoid obscure bugs. Such tests are time consuming, but are essential for commercial software. A bug in a commercial or industrial package can be very expensive in terms of time, money and reputation. This and good documentation are two reasons for the often higher cost of good software.

Listing 5: Test Program

```
100 CLS:POKE1020,10:POKE1021,0
200 FORX=1TO256
300 T1=PEEK(1020):T2=PEEK(1021)
400 T2=T2-2
500 IFT2>=0THEN800
550 T1=T1-1:T2=T2+256
600 T3=PEEK(1020):T4=PEEK(1021)
700 T5=T3*256+T4
800 T5=T5-2:T3=INT(T5/256):T4=T5-256*T3
900 IFT1-T3=0ANDT2-T4=0THEN1200
1000 PRINT"TEST FAIL"
1100 STOP
1200 POKE1020,T1:POKE1021,T2
1250 PRINT@0,X
1300 NEXTX
1400 PRINT"TEST O.K."
1500 END
```

Line 100 sets up start conditions for two consecutive memory bytes. Line 200 sets up a loop which will cycle the program through all possible values of the lower byte. Lines 400-550 carry out one method of subtraction. Lines 700 and 800 carry out the second method. Line 900 compares and takes appropriate action.

Because the methods are both correct, this test will always show a succesful completion. During the test the value of 'X' is printed on the screen to allow progress to be monitored. If lines 500 and 550 are deleted, thus ignoring the borrow situation, the test will fail at two values (zero and one) of Location 1021. The program halts with an error in this case. It can be run successfully by starting with a value of two for location 1021 in Line 100, thereby duplicating the error in the original program.

This method of testing does not apply to all types of programs, but where applicable it is a powerful tool in the software quality armory. The cassette merge procedure is a useful one, too, and I would encourage readers to learn and use it. It can also be used with advantage in some disk situations as an alternate to the *MERGE* command.

One-Liner Contest Winner . . .

Remember those big all-day suckers? This program draws an ever-changing lollipop.

Paula Vaske
Beloit, WI

The listing:

```
10 PMODE1,1:SCREEN1,1:D=RND(54):
C=RND(8):CIRCLE(128,54),D,C:DRAW
"C7BM124,184U80D80R10U80L10":PAI
NT(129,158),7,7:DRAW"C6BM0,0R245
D245L245U245":RUN
```

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Simulations* and its companion *Rainbow Simulations Tape.*)

One-Liner Contest Winner . . .

This 32K program shows you what popcorn looks like during the actual popping process. (Actually, it draws popped kernels over eight *PMODE 0* graphics screens, then switches screens at random.)

Mike Kilby
Englewood, OH

The listing:

```
0 PCLEAR8:FORP=1TO8:PMODE0,P:PCL
S:FORN=1TO60:X=RND(250):Y=RND(18
0):DRAW"BM"+STR$(X)+","+STR$(Y)+
";R2DRFL4UDL2DGDFU2ED5R2UL2U3RUD
R2UDL":NEXTN:NEXTP:FORL=1TO5000:
P=RND(8):PMODE0,P:SCREEN1,0:SOUN
DP,1:FORT=1TO100:NEXTT:NEXTL
```

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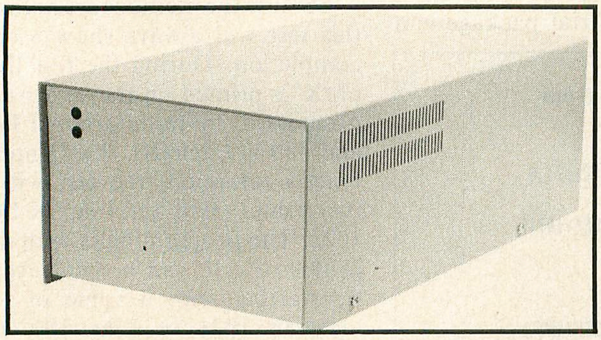

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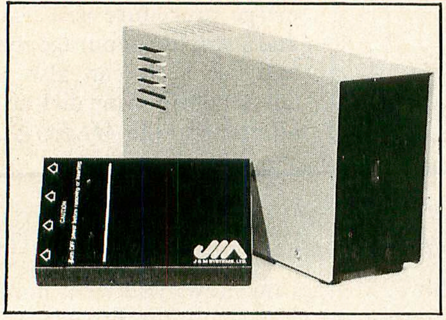

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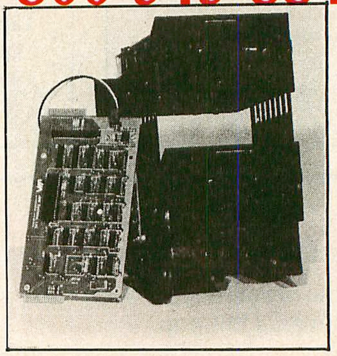

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ML UTILITY

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Speed up typing of machine language programs with this monitor

CoComon Junior

By Steve Roberts

There are plenty of monitors available out there in the program world, and you're probably saying to yourself, "Not another monitor!", but *CoComon Junior* has some advantages the beginning machine language programmer is looking for to make typing in programs easier.

It can also be used to examine machine language programs. It can be used to execute programs already in memory, or something you have just typed in, so you can see the results immediately. If you already have a program in memory and you want to examine it, but you don't know where the program starts in memory, you can use the find section of the program. *CoComon Junior* has everything I needed and wanted in my "beginner days," and it should help to give you a good start in machine language.

I will first explain how to use the program, then I'll explain how the program works.

CoComon Junior will first go to the main menu and ask you what you would like to do. There are four choices:

1) Type in a machine language program.
2) Examine a machine language program.
3) Find a machine language program.
4) Execute a machine language program.

Press '1' first; you will see instructions on how to type a machine language program into memory. Then press 'L' and you are now ready to start typing in your program.

Typing in machine language with this monitor is unique. Since data in machine or assembly language programs is usually a maximum of four bytes or eight bits or digits in one line, the program is designed so you can input up to four bytes at one time to speed up typing in those long programs, instead of having to press ENTER after each byte (as it is with most monitors).

The program is made so it will work with as few keystrokes as possible; you will rarely have to press the ENTER key. On an average, you can type in a program up to one-third faster than with normal monitors. Next, press 'M' to go back to the main menu.

Press number '2' and see what happens next. Press 'E' and start examining by using the left and right arrow keys to look through memory. You have now entered the examining mode. Do not let that scare you. I know it sounds a little scary at first, but do not worry. In reality, a beginning programmer would not have to use this function very often, but I do suggest it for checking machine language programs for errors after you have typed them in. (You could also use it just to snoop around if you have a curious nature, maybe check out some of the ROM to see what makes your CoCo tick.) Now, go back to the main menu by pressing 'M'.

Press number '3' and you will now see the instructions on how to use this section. Press 'F' and you will see the starting, ending, and executing addresses of your program. This is not always really accurate, but get the starting address, then go to the examine mode and see if that is, indeed, your program. Press 'M' to go back to the menu.

Now press '4' and you will see the instructions on how to execute your machine language program. Press 'X' and type in the executing address. Press 'M' to go back to the menu.

Pressing '5' will make the program end.

Input Requirements

1) You will not have to press ENTER when typing in the addresses if you input four digit numbers. If they are not four digit numbers, put a zero before the number, or you can just press ENTER if you like.
2) All inputs *must* be in hexadecimal!

Program Summary

Line Numbers	Function
10-30	The title, my name and the copyright.

40	*GOTO* the main menu.
50	The start of the load section.
80-150	The *INKEY$* input routine. Get the Hex bytes.
160-270	Convert to decimal then back to hexadecimal, then print out to the screen:
280	End of the load section.
290	The start of the examining mode.
320-380	The *INKEY$* input section.
	Get the starting address.
390-450	Convert to decimal then back to hexadecimal, then print out to the screen.
460	Start of the find section.
470	A=start address, B=end address, C=execute address.
480-530	Change them to hexadecimal then print them on the screen.
540	Start of the execute section.
550-630	The *INKEY$* input section.
640-670	Change the input to decimal, define *USR* then execute.
680-770	Main menu section.
780-830	Directions for the load section.
840-890	Directions for the examine section.
890-930	Directions for the find section.
930-980	Directions for the execute section.

200	219
410	55
560	194
750	182
860	42
END	253

The listing:

```
10 '*****COCOMON JUNIOR****
20 '**BY STEVE ROBERTS**
30 '**COPYRIGHT (C) 1983**
40 GOTO 670
50 CLS:PRINT"     LOADING MACHINE
 LANGUAGE":PRINTSTRING$(32,"="):
PRINT:PRINT@136,"ADDRESS     BYTE
":PRINT@419,"PRESS (ENTER) TO LO
AD":PRINT@450,"INPUT (M) TO RETU
RN TO MENU"
60 PRINT@67,"STARTING HEX ADDRES
S"
70 SCREEN 0,1
80 FOR X=1 TO 4
90 AV$=INKEY$:IF AV$="" THEN 90
100 IF AV$="M" THEN 40
110 IF AV$=CHR$(13) THEN 160
120 PRINT @87+X,AV$
130 SCREEN 0,1
140 AD$=AD$+AV$
150 NEXT X
160 AD$="&H"+AD$:Q=VAL(AD$):Q=Q-
1
170 PRINT@64,STRING$(31," "):PRI
NT@75,STRING$(10," ")
180 PRINT@66,"HEX BYTES"
190 FOR X=1 TO 8
200 SCREEN 0,1
210 AV$=INKEY$:IF AV$="" THEN 21
0
220 IF AV$="M" THEN 40 ELSE IF A
V$=CHR$(13) THEN 260
230 PRINT@76+X,AV$
240 A$=A$+AV$
250 NEXT X
260 PRINT@196,STRING$(120," "):P
RINT@136,"ADDRESS     BYTE":IFA$=
"M" THEN 670 ELSE 270
270 FORA1=1TOLEN(A$)STEP2:SCREEN
0,1:A5$=MID$(A$,A1,2):Q=Q+1:A5$=
"&H"+A5$:A4=VAL(A5$):POKEQ,A4:PR
INTTAB(10);HEX$(Q);TAB(20);HEX$(
A4):NEXTA1
280 A$="":AD$="":AV$="":GOTO 170
290 CLS:PRINT"     EXAMINE MACHIN
E LANGUAGE":PRINTSTRING$(32,"=")
300 PRINT@64,"STARTING HEX ADDRE
SS"
310 SCREEN 0,1
320 FOR X=1 TO 4
330 AV$=INKEY$:IF AV$="" THEN 33
0
340 IF AV$=CHR$(13) THEN 390 ELS
E IF AV$="M" THEN 40
350 PRINT@85+X,AV$
360 SCREEN 0,1
370 A$=A$+AV$
380 NEXT X
390 PRINT@355,"PRESS M TO RETURN
 TO MENU":Z$="&H"+A$:A=VAL(Z$)
400 A$="":AV$=""
410 Q2=PEEK(A):PRINT@160,"ADDRES
S    ASCII    BYTE":PRINT@226,HEX$
(A):PRINT@236,CHR$(Q2):PRINT@243
,HEX$(Q2)
420 SCREEN 0,1
430 Z3$=INKEY$:IFZ3$=CHR$(9)THEN
440ELSEIFZ3$="M"THEN670ELSEIFZ3$
=CHR$(8)THEN450ELSE430
440 A=A+1:GOTO410
450 A=A-1:GOTO410
460 CLS:PRINT"    FIND MACHINE LA
NGUAGE PROG.":PRINT@32,STRING$(3
2,"=")
470 A=PEEK(487)*256+PEEK(488):B=
PEEK(126)*256+PEEK(127)-1:C=PEEK
(157)*256+PEEK(158)
480 PRINT"STARTING ADDRESS=";HEX
$(A)
490 PRINT"ENDING ADDRESS=";HEX$(
B)
500 PRINT"EXECUTING ADDRESS=";HE
X$(C)
```

```
510 PRINT@355,"PRESS M TO RETURN
 TO MENU"
520 SCREEN 0,1
530 A2$=INKEY$:IFA2$="M"THEN670E
LSE530
540 CLS:PRINT"   EXECUTING MACHI
NE LANGUAGE":PRINTSTRING$(32,"="
)
550 PRINT@128,"EXECUTING ADDRESS
"
560 SCREEN0,1
570 FOR X=1 TO 4
580 AV$=INKEY$:IF AV$="" THEN 58
0
590 IF AV$=CHR$(13) THEN 640 ELS
E IF AV$="M" THEN 40
600 PRINT@145+X,AV$
610 SCREEN 0,1
620 F$=F$+AV$
630 NEXT X
640 F1$="&H"+F$:X7=VAL(F1$):DEFU
SR0=X7:X=USR(0)
650 SCREEN 0,1
660 PRINT@352,"PRESS M TO RETURN
 TO MENU":I$=INKEY$:IFI$="M" THE
N 670 ELSE 660
670 CLS:SCREEN0,1
680 PRINT:PRINT"THIS IS A MONITO
R PROGRAM FOR   THE COLOR COMPUT
ER. IT HAS FIVE MAIN FUNCTIONS.
690 PRINT"    (1)  TYPE IN A MAC
HINE          LANGUAGE PROGRAM."
700 PRINT"    (2)  EXAMINE A MAC
HINE          LANGUAGE PROGRAM."
710 PRINT"    (3)  FIND THE STAR
TING,         ENDING AND EXECUTING
ADDRESSES     OF A MACHINE LANGUAGE
 PROGRAM."
720 PRINT"    (4)  EXECUTE A MAC
HINE          LANGUAGE PROGRAM."
730 PRINT"    (5)  END THIS PROG
RAM."
740 PRINT" enter            1, 2, 3
, 4 or 5"
750 SCREEN0,1
760 I$=INKEY$
770 IF I$="1" THEN 780 ELSEIF I$
="2" THEN 840 ELSE IF I$="3" THE
N 890 ELSE IF I$="4" THEN 940 EL
SE IF I$="5" THEN END ELSE 760
780 CLS:PRINT:PRINT"TO TYPE IN A
 MACHINE LANGUAGE   PROGRAM WIT
H THIS MONITOR JUST  TYPE IN THE
 HEX AS YOU SEE IT   APPEAR ON Y
OUR COPY."
790 PRINT:PRINT"THEN PRESS enter
```

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BASIC COMPILER

MLBASIC 1.0 - BASIC COMPILER

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COMMANDS SUPPORTED

1. I/O -Commands
   CLOSE CLOADM CSAVEM DIR DRIVE DSKI$
   DSKO$ FIELD FILES GET INPUT KILL
   LSET OPEN PRINT PUT RSET
2. Program Control Commands
   CALL END EXEC FOR STEP NEXT
   GOSUB GOTO IF THEN ELSE ERROR
   ON..GO RETURN STOP SUBROUTINE
3. Math Functions
   ABS ASC ATN COS CNV EOF
   EXP FIX INSTR INT LEN LOG
   LOC LOF PEEK POINT PPOINT RND
   SGN SIN SQR TAN TIMER VAL
4. String Functions
   CHR$ INKEY$ LEFT$ MID$ MKN$ RIGHT$
   STR$ STRING$
5. Graphic/Sound Commands
   COLOR CLS CIRCLE DRAW LINE PAINT
   PCLEAR PCLS PLAY PMODE PRESET PSET
   RESET SCREEN SET SOUND
6. Other/Special Commands
   DATA DIM LLIST MOTOR POKE READ
   REM RESTORE RUN TAB VERIFY DLD
   DST IBSHFT LREG PCOPY PMODD PTV
   REAL SREG SWP VECTD VECTI

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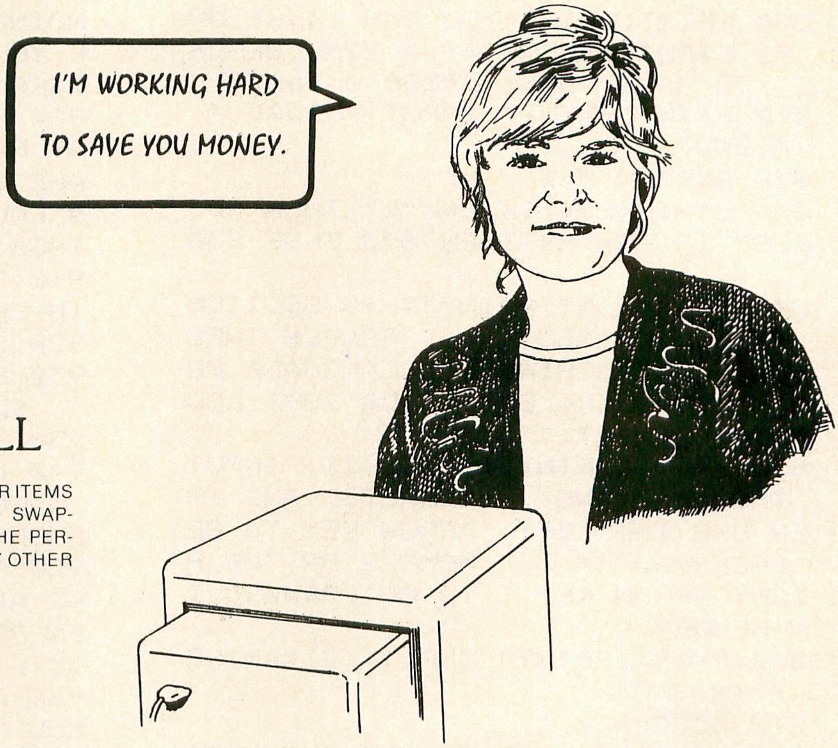

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____

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```
 TO LOAD THE HEX INTO MEMORY."
800 PRINT:PRINT"YOU CAN input UP
 TO EIGHT DIGITS AT A TIME BEFOR
E YOU HAVE TO     PRESS enter."
810 PRINT:PRINT" INPUT (L)OAD /
(M)ENU"
820 SCREEN 0,1
830 L$=INKEY$:IF L$="L" THEN 50
ELSE IF L$="M" THEN 670 ELSE 830

840 CLS:PRINT:PRINT"THIS SECTION
 WILL HELP YOU       SEARCH THRO
UGH YOUR MACHINE     LANGUAGE PR
OGRAM TO FIND ERRORS OR JUST LOO
K THROUGH IT."
850 PRINT:PRINT"TO USE IT, INPUT
 THE STARTING     ADDRESS, AND TH
EN USE THE LEFT   ARROW KEY TO GO
 BACKWARD IN      MEMORY OR THE R
IGHT ARROW KEY    TO GO FORWARD I
N MEMORY."
860 PRINT:PRINT" INPUT (E)XAMINE
 / (M)ENU"
870 SCREEN 0,1
880 E$=INKEY$:IF E$="E" THEN 290
 ELSE IF E$="M" THEN 670 ELSE 88
0
890 CLS:PRINT:PRINT"THIS PART SI
MPLY GIVES YOU THE   STARTING, E
NDING AND EXECUTING  ADDRESSES O
F YOUR MACHINE       LANGUAGE PR
OGRAM."
900 PRINT:PRINT"SOMETIMES THIS M
AY NOT WORK      BECAUSE OF GARB
AGE IN THE       MEMORY WHICH CA
N CAUSE IT TO    GIVE FALSE READ
INGS."
910 PRINT:PRINT" INPUT (F)IND /
(M)ENU"
920 SCREEN 0,1
930 F$=INKEY$:IF F$="F" THEN 460
 ELSE IF F$="M" THEN 670 ELSE
930
940 CLS:PRINT:PRINT"THIS SECTION
 WILL EXECUTE YOUR   PROGRAM THR
OUGH THE USR         FUNCTION."
950 PRINT:PRINT"INPUT THE STARTI
NG ADDRESS OF    YOUR PROGRAM TH
EN PRESS ENTER   AND IT WILL EXE
CUTE IT FOR YOU."
960 PRINT" INPUT E(X)ECUTE / (M)
ENU"
970 SCREEN 0,1
980 X$=INKEY$:IF X$="X" THEN 540
 ELSE IF X$="M" THEN 670 ELSE 9
80
```

PAYROLL

Includes 1985 New Tax Tables

PAYROL/BAS®

Ready to run on a system with 64K Extended Basic (w/printer and one disk drive), Howard Payrol/BAS® has everything you need to do payroll for a business of up to 50 employees, including:

Entering employee information: name, address, SS#, wages or salary, starting date, year-to-date earnings.

Summary program: monthly listing of all checks' gross income, FICA, taxes, profit sharing, insurance.

Cutting checks: usable with either pin-feed or friction-feed printers. (We can supply checks.)

We don't leave you alone out there, either! An order puts you on our list for quarterly updates of tax information, etc.

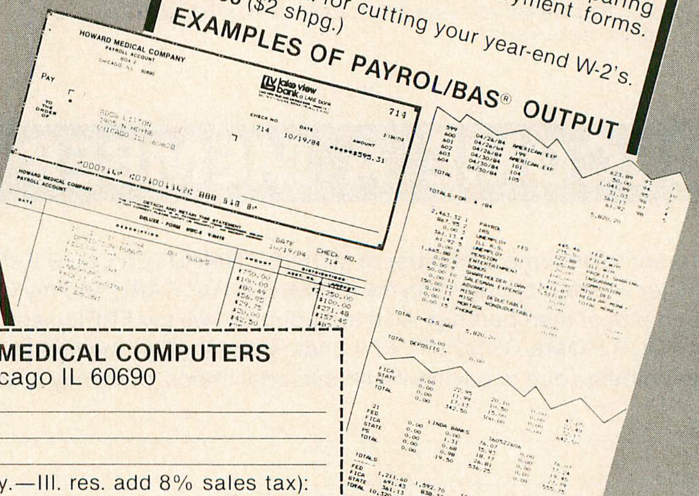
$79.95
($2 shpg.)

Other Helpful Programs

941 Program: gives individual summaries (and totals) of check information for preparing federal 941 and state unemployment forms. **$29.95** ($2 shpg.)

W-2 Program: for cutting your year-end W-2's. **$29.95** ($2 shpg.)

EXAMPLES OF PAYROL/BAS® OUTPUT



SEND TO: HOWARD MEDICAL COMPUTERS
Box 2, Chicago IL 60690

Name
Address
City, State, Zip
Please send (desc. & qty.—Ill. res. add 8% sales tax):

include card #
exp. date

DEALER INQUIRIES INVITED RB1284a

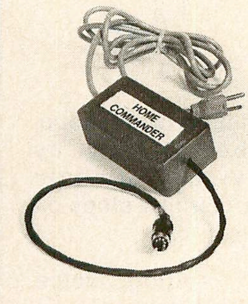
HOWARD MEDICAL

Telephone 312/278-1440
Computer Bulletin Board
312/278-9513

NEW!

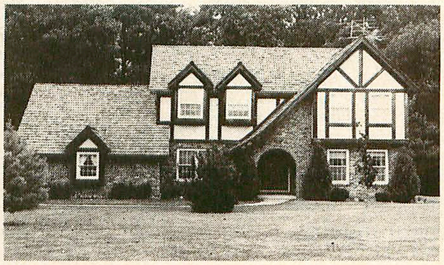
'HOME COMMANDER' $49.95

BSR CONTROL MEETS THE CoCo



CONTROL YOUR WORLD

Give yourself piece of mind while on vacation by programming the HOME COMMANDER to control lamps, radios, TVs and more. Or make life easy on yourself by turning on the coffee pot before you wake up. You can do this and more with the HOME COMMANDER.



NO WIRES NECESSARY

The HOME COMMANDER uses your home's existing electrical wiring to control virtually anything. Appliances are controlled via small control modules (sold separately). The LAMP DIMMER MODULE allows you to turn a lamp on or off and control 16 brightness levels. The APPLIANCE MODULE is used to control appliances up to 400 watts such as a TV, radio, stereo system, fan or motor.

ON FRIDAY 7:42 PM, OFF SUNDAY 1:26 AM

Included FREE is a program to allow you to control up to 256 devices and specify the time and date they are to be activated. That's right, the software has its own built in accurate clock.

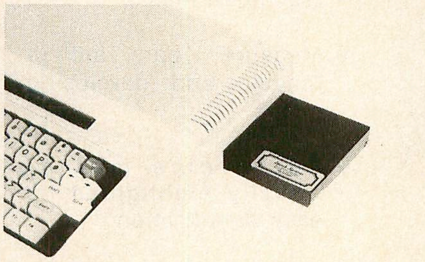
LAMP DIMMER MODULE **$16.95** APPLIANCE MODULE **$16.95**

NEW!

PRECISION TIME MODULE

~~$59.95~~
$49.95
INTRODUCTORY PRICE ENDS FEB. 15

FREE TALKING CLOCK PROGRAM requires VOICE, SUPER VOICE, or SPEECH & SOUND PAK



Now your computer will always know the correct time and date. This amazing precision time module is calibrated to the National Bureau of Standards (WWV) atomic clock and you should never have to change it.

Use the PRECISION TIME MODULE to add the time element to your game. Or use on your BBS so that the time will always be perfectly accurate.

BATTERY BACKUP

Even when your computer is off, the clock keeps correct time by operating using the internal battery backup system.

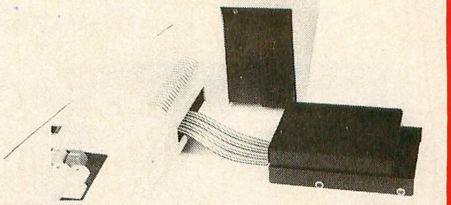
MONTHS, LEAP YEARS & DST

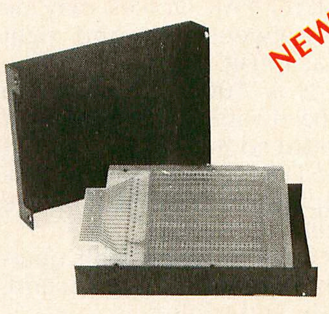
The PRECISON TIME MODULE automatically adjusts for the different number of days in each month as well as leap years. And believe it or not, it adjusts for DST so you don't have to remember if it's SPRING FORWARD or FALL FORWARD.

LOWEST PRICE ANYWHERE

Y-CABLE $28.95

Why pay $100 to $200 for a multi-pak. With the Y-CABLE, you can connect your disk system to your computer along with either our STEREO PAK music synthesizer, our VOICE, SUPER VOICE speech synthesizers, or our PRECISION TIME MODULE. All connectors gold plated.





NEW!

ATTENTION EXPERIMENTERS!

Interested in building your own project? Our oversized board gives plenty of room for construction while the sturdy aluminum case with black satin finish assures protection and a professional appearance.

Prototype Board only **$19.95**
Prototype Enclosure only **$19.95**
Buy both for **$29.95**

Advanced Speech Chip
SSI-263
(SC-02)
$34.95

Need an SC-01? **$29.00**

Disks (any quantity)	$1.49
Tape C-10, C-20	$0.69
Hard Tape Box	$0.29
6821	$2.95
74LS138	$0.79
7407	$0.79
IC sockets 14, 16, 22 pin	$0.29
IC sockets 24, 28, 40	$0.39

FREE BLANK DISK OR TAPE WITH EVERY ORDER

VISA® MasterCard

Dealer Inquiries Invited

We accept CASH, CHECK, COD, VISA and MASTER CARD orders.

Shipping and handling US and Canada	$3.00
Shipping and handling outside the US and Canada	$5.00
COD charge	$2.00

Illinois residents add 6¼% sales tax

Speech Systems

38W 255 DEERPATH ROAD
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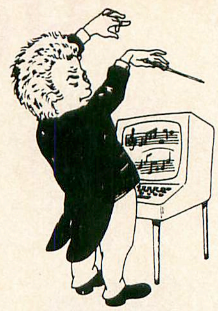
(312) 879-6880 (VOICE)
(312) 879-6811 (24 HR. BBS)

CALL ANY DAY, ANYTIME TO ORDER. ALSO ORDER BY MAIL OR BBS.

NEW!

MUSICA 2



~~Tape $34.95~~
~~Disk $39.95~~

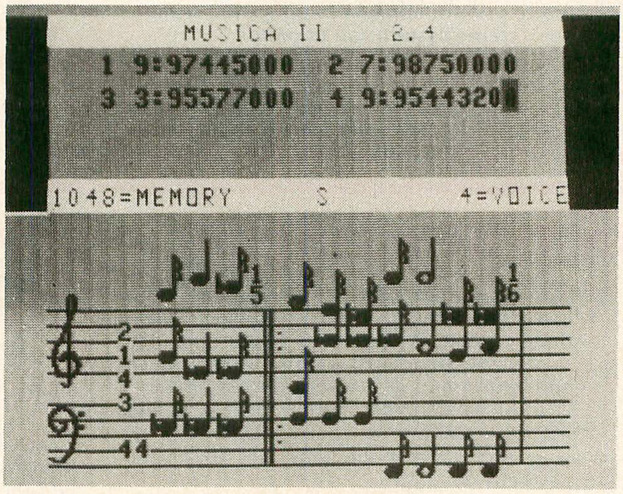
Offer ends
Feb. 15

$29.95
Tape or Disk

- High resolution graphic display, looks just like sheet music.
- Loudness of each voice may be individually specified.
- Memory available is constantly displayed.
- Voice waveshapes may be exchanged between voices at any point.
- Tempo may be specified and may even be altered as the music plays.
- Flats and sharps supported.
- Billions of timbre combinations.

GREAT
MUSIC
TEACHER

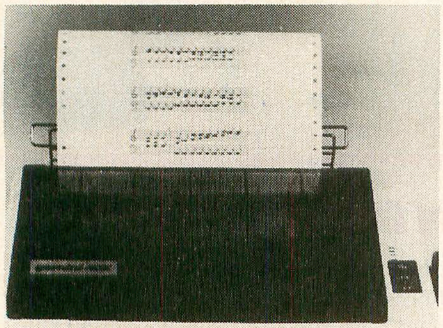
- When in stereo mode, music is played through our STEREO PAK (purchased separately).



```
MUSICA II        2.4
1 9:97445000  2 7:98750000
3 3:95577000  4 9:9544320
1048=MEMORY       S        4=VOICE
```

- Repeat bars allow repeating of music without re-inserting music a second or third time.

- Voice timbre (waveshape) may be altered by specifying harmonic content just like stops on an organ.
- During editing, voice being inserted is displayed.
- Each measure is numbered for easy reading of music.
- Measure bars aid in reading and developing music.
- Each voice may be visually highlighted for easy identification.



Output your music to any dot matrix printer (Gemini 10X, Epson, R.S. printers, Okidata, etc.)

"Musica 2 is GREAT!"
Stephen Wilson

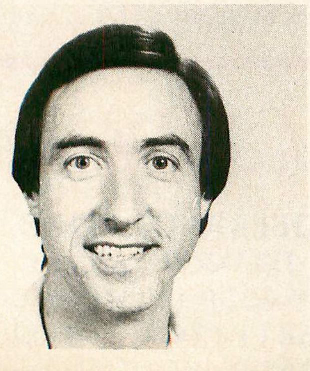
"It's the best four part harmony composer on the market and the most used program in may files."
R.G. Wrights

"Of all the music programs, and I've had them all, there is no comparison in flexibility, simplicity of operation and in the warm vibrant tones that it produces. I went out and spent $700.00 on stereo equipment just so I could more thoroughly enjoy Musica 2 and the Stereo Pak!"
Howard Lentz
TCI Industries

Download
music
from our BBS
or Compuserve

THERE'S MORE

- 4 Voices produced simultaneously
- Input notes from keyboard or joystick
- Play music from your own BASIC program
- Block copy music for easy music development
- 100% machine language so it is lightning fast
- Vibrato effect easily produced
- With STEREO PAK, voices may be switched between left and right speakers as music plays
- MUSICA 2 is 100% software, no need for hardware unless you want music produced in STEREO. In that case, the STEREO PAK may be purchased separately. It's a must for the audiophile!
- Durations include: whole, half, quarter, eighth, sixteenth, thirty second, sixty-fourth, and triplet.
- 30 page manual describes all.



'I THOUGHT ONLY AN APPLE SOUNDED THAT GOOD'

That's what I was told after I gave a seminar and demonstration of MUSICA 2 and the STEREO PAK at the Chicago Rainbowfest. I smiled and thanked the young man for the "supposed" compliment, but upon reflection, I became angered by the apparent belief that the CoCo is inferior in this regard. Nothing could be further from the truth.

To help fight this false belief, we've decided to lower the price of MUSICA 2 to help spread the word.

We will also keep the STEREO PAK price at $39.95 and give you a complete refund if you are not 100% satisfied with the STEREO PAK.

NEW!

STEREO PAK™

Plug this gem into your computer, connect to your home stereo system and sit back and enjoy music realism. The STEREO PAK is a hardware music synthesizer that plays our MUSIC LIBRARY and MUSICA 2 music in stereo. Because it was designed specifically with music reproduction in mind, the sound is superb. The highs are crisp and clear while the bass notes will rattle your walls.

The STEREO PAK is all hardware. It is intended as an enhancement for MUSICA 2 and our MUSIC LIBRARY. Disk owners may use the STEREO PAK with the R.S. Multi-Pak or our Y-CABLE ($28.95)

~~$49.95~~
39^{95}
INTRODUCTORY
PRICE

NEW! MUSIC LIBRARY™ — 3 VOLUMES

BUY 2
GET 3rd
FREE

You get over 100 four voice songs with a combined playing time of 3 hours. That's right, 3 hours of music. You won't belive your CoCo could sound so good. To fit over 100 songs required both sides of 5 C-20 tapes and the disk version uses 5 full disks (that's a half box of disks).

A JUKE BOX selection program is included to allow you to select specific songs or automatically play each. These songs are ready to go, you don't need MUSICA 2 or a knowledge of music.

These songs were developed using the best music program available for the CoCo; MUSICA 2. The tunes may be used as source files for MUSICA 2 and changed by the user. When coupled with the STEREO PAK the songs are reproduced in stereo with unsurpassed realism.

MUSIC LIBRARY 100 categories:

- Stage, Screen, and TV
- Music of the 70's
- Music of the 60's
- Music of the 50's
- Old Time Favorites
- Classical
- Christmas (popular)
- Christmas (traditional)
- Patriotic
- Polka Party

MUSIC LIBRARY 200
Our second volume of 100 tunes, 3½ hours of music.

MUSIC LIBRARY 300
Our third volume of 100 tunes, 3 more hours of music.

MUSIC LIBRARY (Each Volume) . . (32K Tape) . . . **$34.95**
(Specify 100, 200, or 300) (32K Disk) **$39.95**

FREE
SOFTWARE

NEW! SPEECH SYSTEMS DATAPEN

only . . . $29.95

HIGHEST
QUALITY

Two programs are provided free with each DATAPEN. SKETCH is a superb high resolution color drawing program allowing precise drawing and freehand sketching, painting and much more. SHAPE CREATE is a high resolution library shape drawing program. You can even save your work to tape or disk for later display or editing.

The software is shipped on tape and may easily be moved to disk. Included is complete documentation to allow you to integrate the DATAPEN into your own BASIC program.

EASY TO USE!

The DATAPEN is a lightpen, but unlike other light pens, it is far more sophisitcated.

- Insensitive to ambient light.
- Responds to different colors
- Program accessible LED lamp readout
- Switch for program control

WE STAND BEHIND OUR PRODUCTS

Like all our other products, if it is not the best, we won't sell it. If you're not 100% satisfied, merely return the DATAPEN for a complete refund.

FREE
BLANK DISK
OR TAPE
WITH EVERY
ORDER

VISA® MasterCard

Dealer Inquiries
Invited

We accept CASH, CHECK, COD, VISA and MASTER CARD orders.
Shipping and handling US and Canada $3.00
Shipping and handling outside the US and Canada $5.00
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Illinois residents add 6¼% sales tax

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CALL ANY DAY, ANYTIME TO ORDER. ALSO ORDER BY MAIL OR BBS.

'TALKING SOFTWARE'

FOR THE VOICE, SUPER VOICE ™, RS SPEECH & SOUND PAK

RADIO SHACK® SPEECH & SOUND TRANSLATOR

FREE
When you buy
any 5 of our
Talking Programs

We believe that no COCO speech synthesizer gives you the power and flexibility of the SUPER VOICE. Nevertheless, some have decided to go with the Radio Shack SPEECH & SOUND PAK. For those we've decided to open our TALKING LIBRARY by offering the SPEECH & SOUND TRANSLATOR . Just load this program and our entire library is open to you.

But that's not all, this program adds features. You get increased intelligibility, the power of an exception table to specify specific pronunciations, $12.81 is spoken in dollars and cents, 1,234,567 is spoken in millions, thousands, and hundreds, and much more. **$24.95**

TERMTALK All the features of an intelligent telecommunications program plus what appears on the TV is spoken.

- Upload and Download programs
- Control Xmit Protocols
- Full or Split Screen
- Buffer Editing
- Normal or Reverse Video
- It talks

Please specify version (VOICE or RS SPEECH & SOUND PAK)
Tape **$39.95** Disk **$49.95**

TALKING BINGO BINGO was never like this. The VOICE or SUPER VOICE makes all the calls while you sit back and play. Comes with 20 playing cards and 200 markers. High Resolution graphic screen, 3 timing level, ball count and pause control. **$24.95**

ESTHER the talking psychoanalyst. An excellent example of artificial intelligence. She may not solve all your problems, but her insight will amaze you. Just like the original Eliza. **$24.95**

SCORE E-Z A yahtzee type game. Up to six can play. **$24.95**

ADVENTURES

CULT OF THE CAVE BEAR You're a stranded time traveler 50,000 years in the past. Can you fix your time machine while still surviving in this alien environ, and make it back? **$29.95**

SHIP HUNT Play Battleship with your CoCo. All status reports are spoken. Ready battery, aim, fire at will! **$24.95**

FINAL COUNTDOWN You must stop the mad general from launching a missile at Moscow and causing WW III. Has multiple voices for added realism. **$24.95**

STAR TALK You're the Star Fleet Captain. Your mission...destroy the enemies' Dragon Star Ships. All status reports are spoken! **$24.95**

ADVENTURE GENERATOR Create talking adventure games that are 100% Machine Language. Up to 99 rooms, 255 objects, 70 command words and 255 conditional flags.
64K Disk **$39.95**

EDUCATION

CONTEST WINNER

ANIMATED SENTENCES The child builds complete sentences from a graphic menu using keyboard or joystick. The action is then spoken and acted out graphically. It's a great way to learn the parts of speech (ie. verb, subject, noun, etc.) **$24.95**

Congradulations
Glenn
Chamberlin

PRE-SCHOOL

TALKING COUNT TO ONE HUNDRED A program designed to teach the child counting to 100 by 1, 2, 5, and 10 forwards and backwards. **$29.95**

TALKING ALPHABET A program designed to help the pre-schooler master the alphabet. **$29.95**

TALKING NUMBERS & COLORS A must program for the very young. High Resolution graphics to insure attention and concentration. **$29.95**

TALKING NUMBER SKILLS The child becomes familiar with the shape and meaning of numbers. **$29.95**

TALKING CLOCK In these days of the digital clock, children miss an important education. This program aids the student in mastering the traditional analog clock. High Resolution graphics. **$29.95**

GRADES 2 - 6

TALKING SUBTRACTION A program specifically designed to help the student learn subtraction. **$29.95**

KING AUTHOR'S TALES A creative writing tool to allow a child to write compositions, or short stories. Q & A option is also included. **$29.95**

COLOR MATH Addition, Subtraction, Multiplication, and Division are mastered. Student may specify difficulty level. **$24.95**

SPELL-A-TRON Student builds a dictionary of words to be quizzed on. Perfect for Spelling B. **$24.95**

SPELLING TESTER A graphic spelling game. The student is shown objects to be spelled. **$9.95**

POETRY CREATOR The VOICE speech unit is used to speak poetry that is created. **$9.95**

SHORT STORY MAKER A program to create and speak stories created by the child. **$9.95**

FOREIGN LANGUAGE Learn a foreign language. French dictionary is included. **$9.95**

PRESIDENTS The student is able to master the Presidents of the US. **$9.95**

STATES A program designed to aid the student in learning correct spelling of the states. **$9.95**

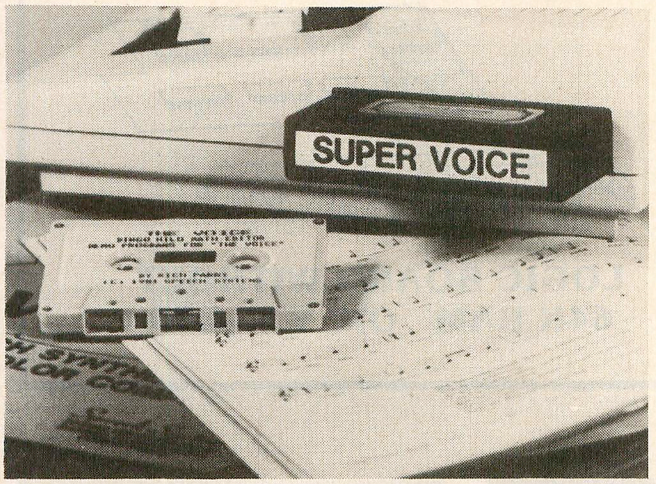
CAPITALS Learning the State's Capitals is made more interesting using speech. **$9.95**

HANGMAN A word guessing game. You must guess the word before you hang. **$9.95**

MATH DRILL A program to help teach arithmetic. **$9.95**

All software, except as noted, shipped on tape but may be moved to disk.

'SUPER VOICE' T.M.



COCO'S MOST ADVANCED SPEECH SYNTHESIZER.

NOW IT TALKS, SINGS AND MORE.

only . . . $79.95

In 1979, VOTRAX brought us the SC-01 chip which made inexpensive speech synthesis possible. Speech Systems was proud to bring the COCO community the first speech synthesizer using this miracle device.

Now Silicon Systems Inc. brings us the SSI 263 (sometimes called the SC-02). Once again Speech Systems is happy to be the first to bring you this breakthrough in speech synthesis. The SSI 263 is the most advanced speech chip available. Read "Build a Third Generation Phonetic Speech Synthesizer" in the July 84 issue of BYTE magazine for details of this amazing chip.

The SUPER VOICE gives you COCO's most intelligible speech. In addition, the free TRANSLATOR text-to-speech program allows you to easily write your own BASIC programs. Highest quality speech may be achieved by specifying inflection, intonation, articulation, and filtration. But that's not all, the SUPER VOICE can actually sing over a 6 octave range. And while the SUPER VOICE was intended for speech synthesis, the fact that you can specify complex speech parameters means you can even create sound effects.

FREE SUPER VOICE SINGS THE STAR SPANGLED BANNER

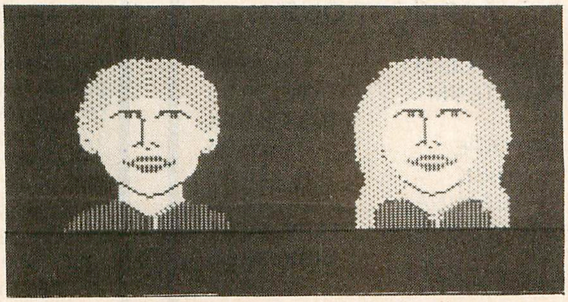
YOU DECIDE

	SUPER VOICE	BRAND X	BRAND Y	BRAND Z
Synthesizer Device	SSI-263	SC-01	SP-256	SC-01
Speaking Speeds	16	1	1	1
Volume Levels	16	1	1	1
Articulation Rates	8	1	1	1
Vocal Tract Filter Settings	255	1	1	1
Basic unit of Speech	64 phonemes 4 durations each	64 phonemes	64 allophones 5 pause lengths	64 phonemes
Pitch Variations	4096 (32 absolute levels with 8 inflection speeds)	4	1	4

SUPER VOICE SONGBOOK VOL. 1

SUPER VOICE sings many of your favorite songs. Start your singing library today! ONLY ...$24.95

SUPER TALKING HEADS



Two heads are better than one.

FREE with your SUPER VOICE order until APRIL 15

When the SUPER VOICE speaks in a low pitched voice, the man speaks, when a high pitched voice is used the woman speaks. **$24.95**
(see special offer)

Radio Shack® SPEECH & SOUND PAK version **$24.95**

FREE BLANK DISK OR TAPE WITH EVERY ORDER

VISA® MasterCard

Dealer Inquiries Invited

We accept CASH, CHECK, COD, VISA and MASTER CARD orders.

Shipping and handling US and Canada	$3.00
Shipping and handling outside the US and Canada	$5.00
COD charge	$2.00
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128K

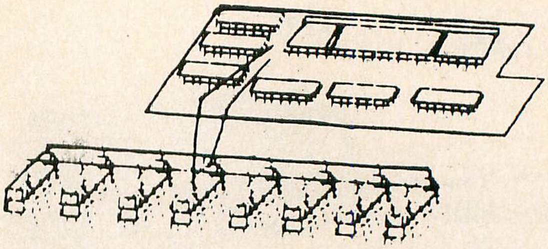
THE EASY WAY

SOLDERLESS MOD FOR

ALL 64K COCOS*

ONLY $99.00

INCLUDES ADDITIONAL 64K OF RAM



LOGIC BOARD WITHOUT
64K RAM ONLY $34.95

BUSINESS

VIP WRITER W/SPELLER		69.95
TELEWRITER-64	TAPE	49.95
	DISK	59.95
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	DISK	32.95
FHL O-PAK		34.95
SPECTRUM VOICE PAK		69.95
TERM TALK	TAPE	39.95
	DISK	49.95
TALKING EDUCATIONAL		24.95
TALKING FINAL COUNTDOWN		24.95
TALKING SCORE-EZ		24.95
COMPUSERVE STARTER KIT		39.95

UTILITIES

FULL SCREEN EDITOR*	19.95
64K SPOOLER *	9.95
SUPER DISK/TAPE *	19.95
GRAPHIC SCREEN PRINT SPECIFY PRINTER	9.95

HARDWARE

RHAPASODY CASSETTE RECORDER	24.95
M/D KEYBOARD	64.95
HJL KEYBOARD	79.99
M/D MONITOR INTERFACE	29.95
SERIAL/PARALLEL INTERFACE*	59.95
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32K WORDSTORE PRINTER BUFFER	199.77
EPSON/LEGEND RIBBONS	7.49
OKI/GEMINI PRINTER RIBBONS	2.95
COLOR GEMINI RIBBONS (RED, GREEN, BLUE, PURPLE & BROWN)	4.95
PERFECT DISK HEAD CLEANING KITS	19.95
MEMTEK MAINTENANCE KIT	19.95
SS/DD DISK (PKG. OF 10)	19.95
COLOR DISK (BOX OF 12)	24.95
DISK STORAGE BOX (HOLDS 10)	2.95

SPECIAL

BUY 2 INTARCOLOR GET THIRD ONE AT HALF PRICE

CANDY CO TAPE/DISK	34.95
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GRAND PRIX TAPE/DISK	34.95
WILLY'S WAREHOUSE TAPE/DISK	34.95

OFFER ENDS 1/31/85

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	DISK	30.95
WORLDS OF FLIGHT	TAPE	29.95
	DISK	30.95
TREKBOER	TAPE	24.95
	DISK	27.95
SEAQUEST	TAPE	24.95
	DISK	27.95
SHENANIGANS	TAPE	24.95
	DISK	27.95
CALIXTO ISLAND	TAPE	24.95
	DISK	27.95
BLACK SANCTUM	TAPE	24.95
	DISK	27.95
VOCABULARY MGMT. SYSTEM		39.95

DSL COMPUTER PRODUCTS INC.

313-582-8930

P.O. BOX 1176 DEARBORN, MI 48121

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P.O. BOX 354 STATION A
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DISK UTILITY

16K DISK

Unlike Disk BASIC's BACKUP command, this program merges the contents of one disk to another without erasing the contents of the destination disk.

Get It Together With Disk Merge

By Paul Gani

Having finally transferred all of my programs from cassette to disk, I was left with a new problem. I had put the contents of each of my cassettes onto a different diskette, and I suddenly found out I was running out of empty ones.

Since each of my diskettes had at least 30 free grans left, I decided to merge them all together. But that left me with a huge task, for that would necessitate typing the syntax for *COPY* dozens of times. To alleviate that problem I wrote *Disk Merge*.

Disk Merge is a form of Disk BASIC's *BACKUP* routine. However, it does not obliterate the data on the diskette to which you are transferring the programs, but rather, as the name suggests, merges the contents of the two together.

To run it, simply enter the program and type *RUN*. If you are using two drives, the program will work automatically. If you only have one drive, you will be prompted to exchange diskettes when necessary. You will have to switch diskettes for every program on the source disk. It may be annoying if you have a few dozen of them, but the other alternative is typing *COPY* "name/ext" for each program. Here, you just have to press ENTER when prompted.

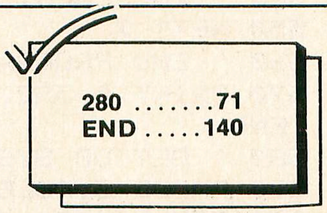
The program listing is rather short because I realize most of you do not want to type in a long program if you have not seen it. Thus, you may run across a few problems when using *Disk Merge*. First, if you have a program on the destination disk with the same name as on the source disk, you will get an error and the program will crash. Just be sure to check for matching names.

Another bug you may find is if the destination disk becomes full, you will also get an error and the program will crash again. Check beforehand using the *FREE* command.

The final "bug" is not a bug in the program, but rather in the Disk BASIC *COPY* command. If for some reason a file is unreadable, you will not get an I/O Error, but rather the computer will freeze up. If the disk has stopped moving and there is no prompt, this has happened. Press Reset to get back to BASIC. To reduce the chance of an I/O Error, keep your drive(s) far away from each other and your TV or monitor. They are usually the main causes of I/O Errors.

The first two bugs mentioned can be fixed by putting in a few routines using *FREE* and *DSKI$*. However, as I have said, I didn't want the program to be too long so I have left those projects for you to do.

If you have any questions about this program, feel free to write me at the address shown at the top of the program. I hope all of you find this program useful.



280 71
END 140

The listing:

```
10 ' ****************************
20 ' ******* DISK MERGE *******
30 ' ****************************
40 ' ** BY PAUL GANI **********
50 ' ** 812 N. COLUMBUS AVE. **
60 ' ** MARSHFIELD, WI 54449 **
70 ' ***************************
100 CLS:GOTO 580
110 ' MENU AND SELECTIONS
120 PRINT @ 3,"***** DISK TRANSF
```

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```
ER *****"
130 PRINT @ 100,"SOURCE DRIVE:";
140 A$=INKEY$:IF A$="" THEN 140
150 S=VAL(A$):IF S>3 THEN 140
160 PRINT S
170 PRINT @ 132,"DESTINATION DRI
VE:";
180 A$=INKEY$:IF A$="" THEN 180
190 D=VAL(A$):IF D>3 THEN 180
200 PRINT D
210 PRINT @ 225,"PRESS <ENTER> T
O START......"
220 IF INKEY$="" THEN 220
230 ' LOAD DIRECTORY-4 PER VAR
240 Y=3:FOR X=1 TO 17 STEP 2
250 DSKI$ S,17,Y,A$(X),A$(X+1)
260 Y=Y+1:NEXT X
270 ' SEPARATE INTO SINGLE FILES
280 FOR X=1 TO 18
290 B$(X*4-3)=MID$(A$(X),01,11)
300 B$(X*4-2)=MID$(A$(X),33,11)
310 B$(X*4-1)=MID$(A$(X),65,11)
320 B$(X*4-0)=MID$(A$(X),97,11)
330 NEXT X
340 ' SORT OUT FILES TO TRANSFER
350 FOR X=1 TO 72
360 IF LEFT$(B$(X),1)=CHR$(0) TH
EN 540
370 IF LEFT$(B$(X),1)=CHR$(255)
THEN 560
380 NA$=LEFT$(B$(X),8)+"/"+MID$(
B$(X),9,3)
390 PRINT @ 296,NA$
400 IF S=D THEN 460
410 ' MULTI-DISK COPY
420 A1$=":"+RIGHT$(STR$(S),1)
430 A2$=":"+RIGHT$(STR$(D),1)
440 COPY NA$+A1$ TO NA$+A2$
450 GOTO 540
460 ' SINGLE DISK COPY
470 A1$=":"+RIGHT$(STR$(S),1)
480 COPY NA$+A1$
490 SOUND 100,5:CLS
500 PRINT "INSERT SOURCE DISKETT
E AND"
510 PRINT "PRESS 'ENTER'";
520 LINE INPUT A$
530 GOTO 540
540 ' INCREMENT TO NEXT FILE
550 NEXT X
560 ' END PROGRAM
570 PRINT @ 359,"FINISHED......"
:END
580 ' SET UP SYSTEM CONTROLS
590 PMODE 0:PCLEAR 1:CLEAR 5000
600 DIM A$(18),B$(72):GOTO 120
```

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SNAKER (THE RAINBOW)
1:26 ★Dan Sobczak, Mesa, AZ
1:57 Susan Ballinger, Uxbridge, Ontario
1:59 Baiju Shah, Deep River, Ontario
2:21 Eric Burk, Williamsvill, NY
STARBLAZE *(Radio Shack)*
11,000 ★Steve Schutjer, Hazel Green, WI
9,950 Albert Diaz, Canoga Park, CA
9,700 Robbie Sablotny, Mt. Zion, IL
9,050 Mark Welte, Baxter, TN
6,850 Craig Alexander, Heflin, AL
6,850 Javier Manzano, Los Angeles, CA
STAR TRADER *(Computerware)*
32 days ★Mark Mulvey, Lancaster, CA
STELLAR LIFE-LINE *(Radio Shack)*
100,070 ★Alex Gatlin, McKinleyville, CA
33,100 Kenn Booth, Grand Rapids, MI
29,670 Craig Alexander, Heflin, AL
22,610 David Sullens, Cabool, MO
16,920 Jeff Loeb, Mobile, AL
STORM ARROWS *(Spectral Associates)*
35,000 ★Stephane Asselin, Hauterive, Quebec
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815 ★Susan Ballinger, Uxbridge, Ontario
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457,460 ★Mark Wooge, Omaha, NE
413,620 Doug Seibel, Tumbler Ridge, British Columbia
248,530 Sally Naumann, Hailey, ID
225,950 Chris Oberholtzer, Lexington, MA
142,200 Fred Naumann, Hailey, ID
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15,600 Stephanie Morgan, Centerville, OH
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94,810 Jean-Marc Parent, Smiths Falls, Ontario
76,275 Michael Rosenberg, Prestonsburg, KY
33,454 Kenneth Bergenham, Lawton, MI
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163,060 ★Michael McCafferty, Oceanside, CA
158,000 Chris Russo, Miami, FL
106,460 Eileen Kaakee, Royal Oak, MI
104,360 Gary Marshall, Layton, UT
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WILLY'S WAREHOUSE *(Intracolor)*
93,700 ★Craig Kluger, Miami, FL
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198,300 Bernard Lamer, St-Joite, Quebec
172,400 Jean-Francois Morin, Loretteville, Quebec
134,800 Sean Conner, Summit, NJ
133,000 Diego Gallina, Summit, NJ
108,600 Theodore Latham Jr., Rich Square, NC
74,400 David Finch, Godfrey, IL

— Debbie Hartley

SCOREBOARD POINTERS

In conjunction with THE RAINBOW's Scoreboard, we offer this column of pointers for our game-playing readers' benefit. If you have some interesting hints and tips, we encourage you to share them by sending them to the Scoreboard, c/o THE RAINBOW.

POLTERGEIST PERJURY

Scoreboard:

Something I would like to bring to your attention is that the highest possible score on *Poltergeist*, by Radio Shack, is 5,205 points. Two people listed in December '84's "Scoreboard" had 6,730 and 6,600 points. This is impossible!

Ken Krejca
Chicago, IL

GONE WITH THE WIND

Scoreboard:

I have some hints for people with *Madness and the Minotaur.* To get the first spell, you need the food and the mushroom. If a strong gust of wind blows the lamp out of your grasp, use this spell to restore it to you. Another tip: when you first start a new game, do W,W,N, and LOOK POOL.

I have solutions to this Adventure as well as to: *Raaka-Tu, Pyramid, Bedlam, Sands of Egypt, Dungeons of Daggorath,* and *Keys of The Wizard.* If you need a clue, or the complete solution, please write to me at 318 Brady Circle, 32055.

Steve Danielson
Lake City, Fl

SAO PAULO PEN PAL

Scoreboard:

I have answers to the following Adventure games (Hi-Res version): *Black Sanctum, Shenanigans* and *Sea Quest.* Anyone needing help for these Adventures, or wanting to exchange letters, please write to me at Rua General Osorio, 1526 Campinas.

I'd like to say thanks, and I'm waiting that my wish will be done as soon as possible.

Henrique Porto
Sao Paulo, Brazil

CALLING ALL COCO NUTS

Scoreboard:

Recently, I have been to RAINBOWfest, and let me say it was great for my first time going. I bought *Trekboer* by Mark Data, and solved it in one week.

If anyone needs answers or clues, please send a SASE to Mike's Room, 208 Osage Ave., 08083. I am interested in talking to people who are "into" CoCos. I will be happy if you write me a letter sometime.

Mike Rebbecchi
Somerdale, NJ

A GOOD DEAL

Scoreboard:

I've done it. I have finally solved *Madness and the Minotaur*, and so can you. If anyone has trouble, don't worry. I have the answers. I will give you five pages of information on solving *Madness and the Minotaur,* including how to obtain all the spells. I will give you a map of all four levels, answers to the oracles' riddles, and lists of all the verbs, objects, treasures and spells in the game. Just sent $1 and a SASE to me at 18 Chapin Road, 11735.

Rich M. Apollo
Farmingdale, NY

FLASK FLAP

Scoreboard:

I have recently solved the Adventure game *Dungeons of Daggorath.* I have a word of warning to people who use any ol' flask. The Abye flask is very dangerous. If you look in the Webster dictionary Abye means to pay or punish for using. The hale and thews flasks aid you by making your heart slow to the slowest [rate] or giving you strength. If you have any questions on how to win or need help or tips send a letter stating your problem and I will help you as best as I can. I have also completed *Bedlam* but need help on *Raaka-Tu.* Write me at 2347 Grace Avenue, 95521.

Alex Gatlin
McKinleyville, CA

BUG TRAFFIC

Scoreboard:

I have solved these Tom Mix graphics Adventures: *Sea Quest, Calixto Island, Black Sanctum.* If anyone is hung up in one of those, you are welcome to send me a SASE and I'll give you the clue you need. But I hit a snag in *Shenanigans* when I landed in the pub. I tried ordering the Gaelic beer, but it didn't seem to work any better than the other brands. I would appreciate some tips, as I seem to have run plumb out of ideas.

A suggestion for *Megabug*: keep changing direction; never pass up an intersection without sending a spur every way you can. Proceed from loop to loop, and save the dead ends until it is safe to try them (meaning there are no bugs nearby.) Write to P.O. Box 15564, 20003

John Tiffany
Washington, D.C.

BEAT BASHAN

Scoreboard:

I purchased *The Kingdom of Bashan* after reading your review in the November '84 issue of THE RAINBOW. *The Kingdom of Bashan* is yet another very good Adventure from Owls Nest Software.

Having solved the Adventure with 200 points and 259 turns I realized that it is not an unbeatable score but it will give other Adventurers something to shoot for. If anyone needs help with *The Kingdom of Bashan*, send me a SASE and state your problems. My address is 316 W. 15th St., 82601. I will answer as soon as possible.

THE RAINBOW is the most dedicated computer magazine I have ever seen, truly something for everyone. Keep up the great work.

Greg Dorsha
Casper, WY

PANEL DISCUSSION

Scoreboard:

I have a clue for *Pyramid.* If you go in the room with the Lamp, Bottle, and Food, type PANEL and you will teleport to the large room with the broken rock wall. Type PANEL again and you will go back. This will save you a lot of time and trouble.

I have also solved *Raaka-Tu, Bedlam, Calixto Island, Black Sanctum,* and the Scott Adam's *Adventureland.* If you need any clues or solutions send a SASE to P.O. Box 2581, 27948.

If anybody can tell me how and where to get the drinking container in *Sands of Egypt* it would be greatly appreciated.

Scott Lawrence
Kill Devil Hills, NC

Using Your Computer To Help Develop Classroom Material

By Michael Plog, Ph.D.
Rainbow Contributing Editor

The use of the computer in education is not limited to computer assisted instruction, computer managed instruction and administrative programs. One often overlooked use of computers is the preparation of materials for students. When using the computer to prepare materials for a classroom, students do not ever have to see or touch a computer. In fact, teachers can use their home computers to prepare materials to be brought into class.

Let me give you a few examples from personal experience. My wife is a teacher for students with learning disabilities. She spends many hours at home preparing materials for her students. One type of material is a word find puzzle, using spelling words of the week. Since only three or four of her students would have the same list of words, this meant a lot of different puzzles. The first program I ever wrote on the Color Computer would take a list of words and create a word find puzzle. The program has undergone several revisions and improvements, but still produces the same output. Instead of spending all that time preparing the word find puzzles, I now type in a list of her words, and the computer produces a matrix of letters, with words hidden among random letters.

Another type of exercise she prepared for students is a word scramble. A word is provided for the students, spelled correctly and then repeated four times, with the letters scrambled in all the repetitions except one. The students have to select the correctly spelled word. The Color Computer is ideal for this task. All I do now is type in her list of words, and turn on the printer; the computer then produces the word scramble.

These may sound frivolous to you, but they are not simple tasks for students with perceptual problems. The word find puzzles are providing experience with figure/ground relationships, which is a major problem for some students. The word scramble is a visual discrimination and visual sequencing while a child without realizing it, but children with a visual discrimination and sequencing disability need practice before they can read and spell effectively.

Preparation of such materials using the computer is not limited only to lessons for students with learning disabilities. The computer can help prepare materials for any type of student. Consider a simple example for students in primary grades. One duty for educators is to teach kids how to write, that is, draw letters that can be recognized. It does not require much advanced knowledge of graphics to program a computer to use the period key on a printer to make big letters — which can be "filled in" by students. The practice of drawing correct letters is necessary before students can write adequately. (If you doubt this, check with your mother. She probably has some early efforts of yours tucked away somewhere.)

Of course, the use of a graphics printer can produce some wonderful materials for students. Instead of having all students in the class draw (or color) that same dumb leaf in the fall, pumpkin at Halloween, or snowflake in the winter, why not produce different designs for students? A graphics

(Michael Plog received his Ph.D. degree from the University of Illinois. He has taught social studies in high school, worked in a central office of a school district, and currently is employed at the Illinois State Board of Education.)

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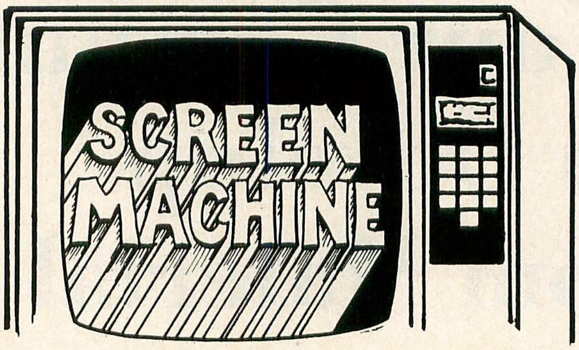
Sugar Software



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printer (and some good programming) can eliminate the sameness of classroom worksheets. Wouldn't it be wonderful to visit a second grade classroom and see different pictures instead of the same design, altered only by choice of colors?

Do not think that computer generated materials are to be used only by primary grade students. Materials can be developed for any age and grade. The computer makes an ideal way to print tests, for example.

Consider a mathematics test. The same process (multiplication, for instance) can be tested, but with different (random) numbers used for each test. This provides a very good protection against cheating, too. Each student has the same type of problem as the student in the next seat, but should get a different answer. The teacher is providing a variety of test items, but all related to the same skill.

Tests could be individualized in any subject matter. A social studies teacher may want to store over 100 questions on a computer for a single class. At test time, the computer could select a 20 item test (at random or not) for each student — but each student would receive a different set of items. The bank of test items could be continually updated by the teacher at home, without having to constantly create new exams.

By creative use of a database program, it is possible for a literature teacher to individualize test items to optional readings for students. For example, each student could be required to read any four of 10 optional pieces. Exam items for all 10 readings are stored in the computer, along with student names and the selections for each. The computer would then select a group of test items for each student, depending on the passage read.

Imagine the ease of test construction for a foreign language teacher using the item bank concept. Each individual student can only be tested on a small vocabulary list, compared to all the foreign words they are required to know. Using a database and an item bank, teachers can develop individual tests for students, as well as get some idea about what topics need greater coverage for the class as a whole.

With any test form printed by the computer, scoring can be simplified for the teacher. It is not difficult to have the computer print two pages for each test form. The first could have the correct answers printed; the second would have blanks for student responses. Naturally, individual student names could be printed on each test form.

The concept of an item bank for tests can be applied to other uses for computer generated materials. Work assignments, for example, can also be an application of an item bank. A teacher of a writing class might use an item bank for work assignments. Each student could be assigned themes on five topics, with no student having the same five topics, but each topic being assigned to at least three students. While humans may consider the logistics of this type of assignment to be unwieldy, a computer can deliver the correct mix with no complaints.

Many teachers already keep student grades on home computers. Instead of providing quarterly grade cards, it might be worthwhile for students (and parents and teachers) to have more frequent progress reports. Students could be shown their grades every month (or even more often). This simple procedure can eliminate surprises at the end of a grading period. In addition to students knowing their progress, parents can be informed quickly about problems, and the teacher can easily identify difficulties before it is too late for correction. (Just consider the public relations benefits to be gained by teachers with this type of information to parents.)

In all the examples listed above, the major emphasis is on individualization of materials for students. With increased demands being put on teachers' time, it is more and more difficult to provide individual challenges for students. Yet, individualization is necessary in order for education to accomplish its multiple goals. The microcomputer offers a new opportunity for teachers to individualize materials for students.

Your comments and thoughts on these articles are always welcome. If you wish to share your experiences or ideas, please write me at 829 Evergreen, Chatham, IL 62629.

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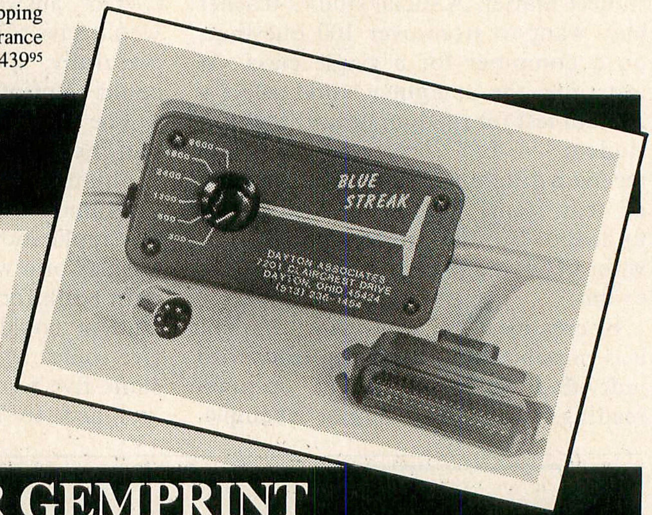
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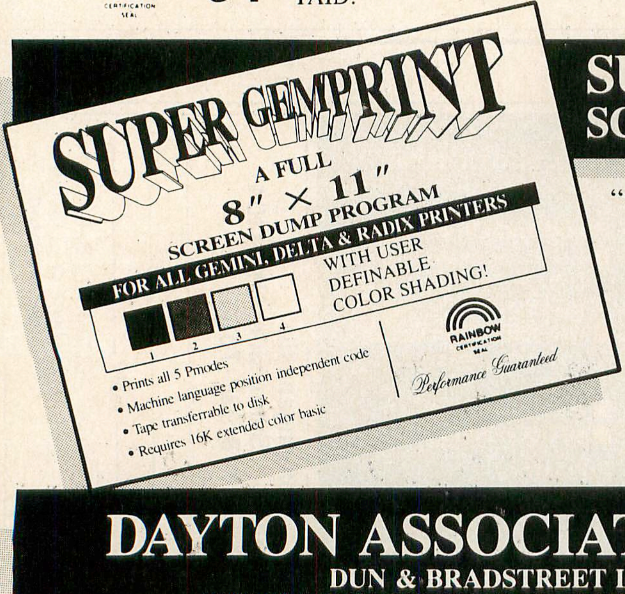
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The following products recently have been received by THE RAINBOW, examined by our magazine staff and approved for the *Rainbow Seal of Certification*, your assurance that we have seen the product and have ascertained that it is what it purports to be.
This month the *Seal of Certification* has been issued to:

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Primary Number Skills, a 32K ECB program covering numeration skills for children preschool through second grade. Two versions are available: TALKING (requires *The Voice*) with synthesized voice on all parts; MUSIC which rewards completion of 10 problems with melody. Both versions include Quit and Help key options. CY-BURNET-ICS, 5705 Chesswood Dr., Knoxville, TN 37912, cassette $29.95, disk $32.95, *The Voice* $79.95 cassette or disk, plus $1.50 S/H, Tennessee residents add 7% sales tax

The Talking Clock and **Clock Arithmetic**, two 32K ECB programs to promote time telling skills for children preschool through third grade. Rewards are provided for each problem and the completion of 12 problems. *The Talking Clock* uses *The Voice* and both programs load automatically and are menu driven. CY-BURNET-ICS, 5705 Chesswood Dr., Knoxville, TN 37912, cassette $29.95, disk $32.95, *The Voice* $79.95 plus $1.50 S/H, Tennessee residents add 7% sales tax

PRO-COLOR-FILE *Enhanced* Ver. 2.0, an all new version of *PRO-COLOR-FILE* including 60 data fields, fast ML sort (750 records in less than five minutes), possible creation of up to 16 indexes for sorting or reporting records and password protection. Derringer Software, Inc., P.O. Box 5300, Florence, SC 29502-2300, disk $59.95 plus $3 S/H

Galactic Fighter, a 32K arcade style game with graphics and sound. This futuristic scenario pits you and your single ship against the invaders from Dracoz. Only a highly alert and strongly motivated (you're the human race's last hope) avenger can succeed against asteroids, enemy fighters and defense lasers. Four Star Software, P.O. Box 730, Streetsville, Ontario, Canada L5M 2C2, cassette $19.95 (U.S.), $24.95 (CND.), disk $24.95 (U.S.), $29.95 (CND.) plus $2.50 S/H

Bugs II, a 64K Adventure that casts you in the role of Captain of the deep space vessel Andromeda, presumed lost. After accidental cryogenic suspension lasting five centuries, you bring the Andromeda home only to find Intelligent Insects have subjugated the human race. You must find and destroy these pernicious vermins' power base. Four Star Software, P.O. Box 730, Streetsville, Ontario, Canada L5M 2C2, cassette $19.95 (U.S.), $24.95 (CND.), disk $26.95 (U.S.), $32.95 (CND.) plus $2.50 S/H

CoCo Paint, a 64K graphics development system for single drive CoCos that mixes graphics and text using built-in or user-defined characters, screen dump to most printers and 300 to 1200 Baud modem communications capabilities. Four Star Software, P.O. Box 730, Streetsville, Ontario, Canada L5M 2C2, disk $39.95 (U.S.), $49.95 (CND.) plus $2.50 S/H

JDG Kalends, a 32K Disk BASIC date book and calendar which features a full-screen editor, auto-repeating keys, Help screen with all keys defined and print-screen option. Jade Products, 519 N. Scott, Wheaton, IL 60187, disk $28

Bumble Games, two 16K cassettes for youngsters aged 4 to 10 to explore basic mathematical concepts containing *TIC-TAC-TOC, Bumble Dots, Find the Bumble, Find your Number, Butterfly Hunt* and *Visit from Space.* The Learning Company, 545 Middlefield Rd., Menlo Park, CA 94025, cassettes $39.95

EASY-EDIT, a 32K text editor requiring at least one disk drive. *EASY-EDIT* is designed for convenience for both assembly language and BASIC programming and offers these text handling capabilities: built-in DOS, 32-64K memory sense, auto key repeat and 51 by 24 character line screen. Mark Data Products, 24001 Alicia Parkway, No. 207, Mission Viejo, CA 92691, disk $34.95

Addition & Subtraction of Fractions & Mixed Numbers, a 16K ECB program to guide a student through every step of the problem. Advice is given to allow immediate corrections of errors. There are nine levels of difficulty with student performance determining the level offered. Timothy McIlwee, R.R. 2, Box 462A, Dundee, IL 60118, cassette $10

The Ideal Host and **Teleremote Executive**, a 32K ECB communication complex requiring two disk drives. Capabilities include conversion of any 16K (and up) computer to a remotely operated mainframe computer. It can be accessed and operated by either smart or dumb terminals and has a two- or optional three-way security check. TITAN Software, 508 West Avenue, Northvale, NJ 07647, $85 plus $4.50 S/H

Juggles' Rainbow, a 16K ECB package for introducing very young children (ages 3 through 6) to the computer. Dancing rainbows and twirling windmills teach reading and math skills. The Learning Company, 545 MIddlefield Road, Suite 170, Menlo Park, CA 94025, cassette $29.95

The Sailor Man, a 64K arcade game that pits Sailorman against Bigfatbadguy in a fight to the finish to determine who will win the heart of Elsie. It features nine screens (levels of difficulty). Tom Mix Software, 4285 Bradford, N.E., Grand Rapids, MI 49505, cassette $29.95, disk $34.95

Dan Tucker's Mine, a 32K ECB Adventure that casts you as sole inheritor of ol' Dan Tucker's legacy: a rumored lost fortune on a vast expanse of forest, mining tunnels, wilderness and abandoned prospecting sheds. Deductive reasoning, logic and a keen sense of purpose can bring you fame and fortune. PAL Creations, 10456 Amantha Ave., San Diego, CA 92126, cassette $14.95

Stone of ROKAN, a 32K Adventure wherein you are Krog, chieftain of the Jamuras, in the land of Caladar. Your deity is ROKAN and after the theft of his sacred stone you must journey through lands of legends and wonders to retrieve the stone before famine and pestilence befall your people. PAL Creations, 10456 Amantha Ave., San Diego, CA 92126, cassette $19.95

The Spanish Armada, your CoCo can become Mr. Peabody's Way-Back machine as this 32K strategic Simulation relives the summer of 1588 on the precarious, always unpredictable, English Channel. Can your English Commanders outmaneuver, outfire and outrun the Duke of Parma's "invincible" Armada? Picosoft Games, P.O. Box 85, Eighty Four, PA 15330, cassette $24.95, Pennsylvania residents add 6% sales tax

Library 2, a 32K graphics library, this second program in the library series for Color Disk *EDTASM* users requires disk drive(s). Capabilities include: 12 commands to draw lines, boxes and circles, GET, PUT, PCOPY and PCLS, single line assembler commands. Sadare Software, P.O. Box 3891, Gaithersburg, MD 20878, disk $24.95

VIP Integrated Library, an applications package containing six stand-alone programs requiring 64K and at least one disk drive. Included are: *VIP Database*, an ML program featuring the *Library* memory sense with bank switching and selectable lowercase displays; *VIP Disk-Zap*, a repair and retrieve utility for bashed, crashed and dashed files, disks and hopes; *VIP Calc*, a worksheet and financial modeling program with memory sense and bank switching allowing 33K of workspace in 64K; *VIP Speller*, a 50,000 word indexed dictionary with add or delete facility; *VIP Terminal*, a communications smart terminal utility featuring selective Baud rates from 110 to 9600, word mode, full 128 ASCII keyboard and automatic graphics mode for sending and receiving programs, messages and other *VIP Library* files; *VIP Writer*, a word processor program with true format and edit windows, printer control codes and on-screen help. Softlaw Corporation, 132 Aero Camino, Goleta, CA 93117, $149.95

BASIC Programming Tricks Revealed, a book by John Gabbard covering useful techniques for BASIC programmers seeking the most from the ever-obliging CoCo. Included are explanations and examples of *PEEKs*, *POKEs* and *VARPTR*. Spectrum Projects, Inc., P.O. Box 21272, Woodhaven, NY 11421 or P.O. Box 9866, San Jose, CA 95157-0866, $14.95 plus $3 S/H

ColorMath, a 64K educational guide requiring a disk drive. Math fundamentals; addition, subtraction, multiplication and division, are presented from beginning concepts to complicated problems with skill level placement. Comes with recommended lesson plans and parents' guide. Tandy Home Education Systems, Radio Shack stores nationwide, disk $19.95

Graphicom Joystick is a special joystick designed for use with the *Graphicom* graphics design program. Spectrum Projects Inc., Box 21272, Woodhaven, NY 11421 or Box 9866, San Jose, CA 95157-0866, $24.95 plus $3 S/H

VIDEO*CLEAR, a kit containing a video cable, its filter block, a coaxial 'F' connector adapter and a 300 ohm BALUM connector to hook up between your computer and your TV set to reduce or eliminate picture interference caused by the computer itself. Spectrum Projects, Inc., P.O. Box 9866, San Jose, CA 95157-0866, or P.O. Box 21272, Woodhaven, NY 11421, $19.95 plus $3 S/H

HQ-Screen-Dump, a 32-64K ECB ML program for the Gemini-10X printer allowing printouts of the images of the Hi-Res *PMODE 4* screen. Zoltan Szili, 2490 Rue Bourdages, Longueuil, Quebec, Canada, J4M 1N9, cassette $12, disk $15

TRI-GRAF and **SHOWMAKER**, two 16K ECB programs compatible with *The Animator*. *TRI-GRAF* functions as a computer graphics studio to develop charts, graphs, artwork, reports, presentations and background scenes for your title screens, games, programs and animated cartoons. *SHOWMAKER* compiles and displays any number of *TRI-GRAF*-generated picture panels. Triad Pictures Corp., P.O. Box 1299, 134 Simders Rd., Sequim, WA 98382, cassette $16 plus $2 S/H

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— **Monica Dorth**

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REVIEWING REVIEWS

VIP CALC

Editor:

We would like to thank RAINBOW for this opportunity to respond to the excellent review of *VIP Calc* by Stuart Hawkinson. It is this type of devotion to fairness and objectivity which will keep RAINBOW as the undisputed leader in Color Computer magazines.

There is really very little to add to this excellent review. We would mainly like to point out how the problems brought up by the reviewer have been corrected. The copy of *VIP Calc* which THE RAINBOW received was one of the initial releases, and therefore had some bugs, all of which have long since been corrected.

The problem Mr. Hawkinson had with the sort feature was not due to the program, but was due to a poor explanation in the manual of how to use the sort function. The manual has since been corrected. The replicate problem was also easily taken care of, as was the locate command bug, and the problems with some of the more arcane trigonometric functions.

While we're here, we would also like to point out one feature which Mr. Hawkinson did not mention, but which is important when comparing the spreadsheet programs on the market. *VIP Calc* has up to eight display windows so that the screen can be split up to show different portions of the worksheet. This feature, which is standard with spreadsheet programs such as *VisiCalc*, *MultiPlan* and *Lotus 1 2 3*, allows the user to juxtapose portions of the worksheet which cannot be seen at one time, even with the high resolution screens, for comparison and easy reference.

More importantly, *VIP Calc* is now a major part of *VIP Integrated Library*. This adds integration to the other advantages pointed out about *VIP Calc*.

Thanks again to RAINBOW.

Tom Nelson
VIP Technologies
Goleta, CA

ADOS

Editor:

There are a couple of comments I'd like to add concerning Dale Shell's fine review of our enhanced Disk Basic *ADOS* that appeared in the December 1984 issue, Page 211.

Since Mr. Shell's review, we have added a major new feature to *ADOS:* error trapping (the equivalent of an ON ERROR GOTO command). This feature was added in response to a surprising number of requests for it that we encountered, particularly from those running BBSs, when *ADOS* was demonstrated at the recent Princeton RAINBOWfest.

Secondly, we would like to clarify Mr. Shell's correct statement that burning *ADOS* into an EPROM may result in loss of the ability to use the high speed poke. In actuality, whether or not the high speed poke is retained depends on the type of EPROM used. We supply a list of sources that will burn *ADOS* into an EPROM (after the user has customized it using the provided utilities) for a total cost of $20, including the cost of the chip. The type of EPROM used by these suppliers will almost invariably allow the high speed poke to be retained. No soldering is involved in the installation of the EPROM; it is simply a matter of unplugging one chip from its socket inside the disk controller and replacing it with the EPROM, an operation for which we provide full instructions.

Arthur J. Flexser
SpectroSystems
Miami, FL

SPECTRUM ANALYZER

Editor:

In regard to the review of *Spectrum Analyzer* by Stuart Hawkinson, let me comment. First, let me thank THE RAINBOW for obtaining such a professional, intelligent, and qualified reviewer for a technical program such as *Spectrum Analyzer*. The program was not designed for "the game-player;" it was written for the serious user of the Color Computer. My description in the Catalog states that this program is for "the professional scientist or engineer or a student in the scientific field." Although the reviewer received a copy supplied on disk, this program, as well as all other scientific or educational programs from Ankia Research, are available on disk or tape. They will work with either medium; however, since data files are more easily stored on disk, that medium is recommended.

Mr. Hawkinson makes three remarks concerning possible drawbacks of the program operation. The first concerns the "fixed length (256)" of the data samples. This has been changed in version 2.0 available at this writing. All owners of version 1.0 have been sent, free of charge, a copy of version 2.0 which lets you vary the length of the sample. Any length of sample from 2 to 256 is allowed (as long as it is a power of 2; i.e., 2,4,8,16, etc.). Mr. Hawkinson mentions the "bothersome . . . display." I would like to announce that version 2.0 also has a reformatted display and the "bug" was corrected which caused an error if data-altering followed a screen output.

Please let me emphasize the comments made in the last paragraph of the review. "The program does compute FFTs correctly. And the machine language version certainly speeds the process." This is no mean feat. The program was written in assembler and uses the floating-point calls to BASIC where necessary. A 256-point FFT takes 16 seconds; a 128-point FFT takes 7 seconds; and all FFTs less than 32 points take less than one second! For comparison, a 256-point FFT in BASIC, with the same algorithm, takes nearly two minutes. Besides, this program is not copy-protected so that users might use it in other specialized software. The good points must certainly outweigh the fact that — you need to know what the program does — before it becomes useful. This is the requirement of any software, especially the professional and educational software of Ankia Research.

Robert K. Tyson
President, Ankia Research
Jupiter, FL

SUPER SPOOLER

Editor:

Thank you to Sandy and Barry Smith for their excellent review of our product *SuperSpooler* on Page 219 of the December 1984 issue.

The review contained only one small error. The reviewers stated that the manual does not show how to change the size of the buffer. However, pages 14 and 15 of the manual explain how to modify the size and location of the buffer.

Also, perhaps space constraints required a shorter review, so the Smiths were unable to mention the powerful features included in *SuperSpooler*; such as reprinting the buffer, checking the status of the buffer and fine-tuning *SuperSpooler* to the user's printer.

Once again, thank you to the Smiths and THE RAINBOW.

R. Lainevool
Tandar Software
Agincourt, Ontario

AUTOTERM

Editor:

I would like to reply to Ed Ellers' review of *AUTOTERM* (November 1984, Page 229). While Mr. Ellers' comments on this program were primarily complimentary, I feel he was not entirely fair in his criticism. He states that the one drawback to the program was the lack of its ability to delete unwanted logon/off protocol. The truth is that the program has a built in provision to handle this or most other user requirements. The KSM function (programmable function keys) allows the user to set up, prior to going online, any combination of deletes/saves he wishes. All the user has to do after this set up is push two keys and stand back. Personally I appreciate the lack of the automatic "header" delete mode. Several of the mainframes charge per minute and assess an additional charge if they have to bill you. The logon time is generally printed in the upper right immediately after logon. Incidentally, I have no connection with PXE Computing other than being a very satisfied customer.

Larry Goldwasser
DeSoto, MO

Editor:

Thanks for whatever time you spent on reviewing *AUTOTERM.* I'm sure that you have other things that make demands on your time.

I did notice one misunderstanding in your review. You implied that the user cannot delete text while in the Send/Receive operating mode, saying that it is a lot of trouble to jump into text editing mode in order to get rid of unwanted text accumulated in the buffer. Actually, the user can delete, edit, etc. while in the Send/Receive mode. Perhaps the manual isn't so good at emphasizing such capabilities. It also appears that you may not realize that CLEAR up-arrow toggles SAVE-TO-MEMORY on and off. The 'M' in the upper right of the screen tells you when SAVE-TO-MEMORY is on.

Hope that these comments make *AUTOTERM* a little more usable for you.

Phil Zwart
PXE Computing
Richardson, TX

Editor:

Mr. Ellers' review of *AUTOTERM* failed to mention several features of the new disk version of that program. He did not mention the new FIND feature, which will search for any string. And although he did discuss the new Hi-Res screen displays, he neglected to discuss some of the screen features, such as the scroll/no scroll mode. Let's give *AUTOTERM* the credit and recognition it truly deserves. I've been using *AUTOTERM* for well over a year, having upgraded from the cassette version to disk (which PXE Computing sent me free). Hats off to author Phil Zwart and PXE for making the best terminal program for any computer.

Robert Codyer
Northboro, MA

Editor:

I would like to comment on Ed Ellers' review of *AUTOTERM* by PXE Computing. The review did not specify which version of the program was reviewed. The disk version that I have been using does not have any of the shortcomings that the reviewer pointed out. *AUTOTERM* offers a convenient method of continuously maintaining a disk file of your session. The MAINTAIN command lets you easily copy to disk only the not-yet-saved portion of your current session. Using the MAINTAIN command has allowed me to download files too large to store in memory.

So far I have only found one operational deficiency. When I try to correct my typing errors on some of the Apple bulletin boards, they echo the "backspace character" and it is displayed on my screen as an "inverse '(' ".

I have been using the program for some time now. As a matter of fact, the first version (2.0D) I received did not have the high-resolution screens. As soon as it was ready, the high-resolution version (3.0D) was sent to me, free of any charges. Only it had a problem, which PXE took care of by sending me version 3.2D; also free of any charges.

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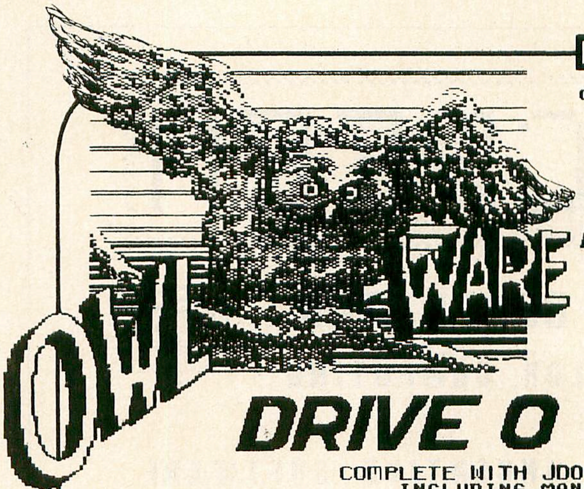

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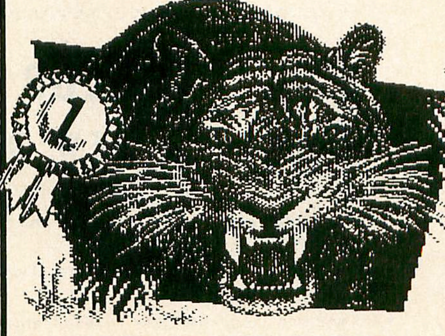

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Flip Side is a creative strategy game for children aged 10 and older. It is written and produced by the Children's Computer Workshop, an activity of Children's Television Workshop (the people who have given us *Sesame Street, The Electric Company* and *3-2-1-Contact*).

To play this game requires a Color Computer with Extended BASIC, a cassette recorder and joysticks. A color television or monitor is necessary as a display (I first tried this game with a black-and-white receiver, but could not differentiate between the red and blue player pieces).

Flip Side is a board game for one or two players. It is remotely similar to Othello and Reversi games, in that players place markers on the board and flip the opponent's pieces (and those of the computer, as well) according to rules established at the start of each game. At the end of each round, the computer flips the pieces of each player according to the same rules. It then displays the score of each player and the number of rounds remaining. Each player tries to fill as much of the screen with his colored markers as he can. The player must use strategy to analyze the continually changing pattern and place his marker to maximize his score.

At the beginning of each game, the player is given the option to play the "standard" game, or he may modify the rules. He can change the number of markers each player may play in any one round, the number of rounds in the game, the number of times the computer will flip at the conclusion of each round, and the rules for flipping markers. (These rules define flips based on the colors of the eight squares surrounding a player's marker. Depending on these colors, a player's piece may be flipped to the opponent's color, unflipped to the background color, or remain unaffected.)

The 15-page instruction book supplied with this game is excellent. It includes detailed setup instructions and a diagram. It also includes a step-by-step procedure to be followed in the event of a loading problem. Detailed playing instructions are included, with numerous diagrams to illustrate game play. And finally, detailed instructions explain how to modify the game.

As you can probably tell, I enjoyed reviewing this game. Although a 10-year-old (remember, this game is recommended for children aged 10 and older) would not be able to develop a sophisticated playing strategy, he would, I think, enjoy the game. And older children would find themselves really challenged to improve their previous scores by developing a more complicated playing strategy.

(Radio Shack stores nationwide, cassette $19.95)

— Jerry Oefelein

MUL-T-SCREEN

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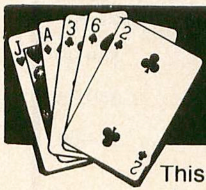

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PP Color Dump Is The Screen Dump You've Awaited

The old saying says that "a bird in the hand is worth two in the bush." A similar expression is true with computer artistry: "a picture on paper is worth several on the screen." Everyone who owns a printer wants the capability of duplicating an interesting graphics screen in hard copy form. Surprisingly, there are very few "screen dump" programs currently available for the popularly priced CGP-115 color printer/plotter. This review is about a new screen dump, called *PP Color Dump* which, if you own a CGP-115, may be the software you have been looking for.

One of the most important characteristics of this type of software is speed. The reason for this is there are potentially over 49,000 pixels (picture elements) of information to reproduce. *PP Color Dump* achieves the desired speed by utilizing machine code. This program is unique in my experience because it is a product of a BASIC program which has been compiled with the Color BASIC Compiler sold by Computerware. This means the program was originally written in BASIC and converted by the compiler program into a form of machine language. The result in this application is quite satisfactory. The speed and quality of this software reflects the capability of the compiler program, as well as the BASIC programming skills of the author.

PP Color Dump is a menu-driven program allowing a variety of options. Among other features you can flip through graphics memory pages, change a particular color, set a different graphics mode and reverse the colors. All this while previewing the results on the screen. You also have the ability to set the high speed poke, which increases the output speed slightly, but the speed of the printout with this program is limited mostly by the plotting rate of the CGP-115. Be prepared to spend about 15 to 20 minutes per color pass.

One of the key features of this screen dump program is its double size printout. One pixel on the screen is reproduced as four points on the plotter. The screen is scanned vertically while the output is printed horizontally. This orientation creates a picture which is nearly the full width of the paper.

Derby City Software has obviously tried very hard to please the customer with this product. This is apparent with a very detailed five pages of instructions on how to use the software. There are also hints on how to save time by eliminating the drawing of the background color (i.e., use white), as well as trouble-shooting hints if something goes wrong.

There is very little to be critical about with this program. I suppose it would have been nice if the program included a 1X as well as 2X printing mode. This would save time for some applications. Also, it should be mentioned that the primary disadvantage of a compiled program is the inefficient use of memory space. Unfortunately for 16K RAM machine owners, a 32K system is needed to run *PP Color Dump*.

There does appear to be one minor bug in the program. This occurs if the space bar is hit after the program has been loaded and *EXEC* typed. The program hangs up with a "TURN THE PRINTER ON" prompt shown on the screen. Turning on the printer at this point does not solicit a response. This minor problem is avoided by hitting ENTER immediately after typing *EXEC*.

PP Color Dump is supplied on tape, but functions equally well with disk. Instructions are included to save the program to disk. Also, according to the instructions, any CoCo can use this screen dump. This means Extended BASIC is not required.

Overall, I believe this program, with a few minor exceptions, is well worth consideration if you are in the market for a decent, easy to use, and reasonably fast screen dump for the CGP-115 printer/plotter. It definitely fills a current need.

(Derby City Software, 3141 Doreen, Louisville, KY 40220, cassette $19.95 plus $1.50 S/H)

— Tom Szlucha

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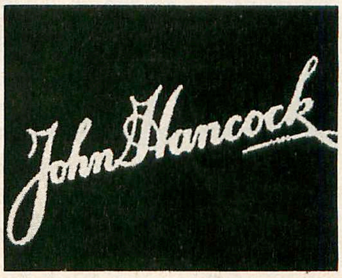

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Spectrum Analyzer:
A Fast Fourier Program

Spectrum analysis involves transforming a signal into its frequency components. From a spectrum, you can tell what frequencies are present and their relative strengths. You can also see the effects of filtering various frequency bands. Normally, spectrum analysis is beyond the means of the casual computer hobbyist.

The Radio Shack *Audio Spectrum Analyzer* program pack allows you to see the frequency components in an audio signal, but the program itself has no facilities for experimenting with various filter functions, or for transforming the frequency response back into a signal. In fact, the program uses a simple "zero-crossing count," rather than an actual Fourier transform to present its approximate results.

The *Spectrum Analyzer*, from Ankia Research, provides the basic facilities for experimenting with the ideas of spectrum analysis and Fourier transforms. You can input data from the keyboard from a previously saved data file on disk, or you can generate a data set using BASIC statements within the program. The options include displaying the results, computing forward and inverse Fourier transforms, and editing (or generating) the data for a signal. The editing section of the program provides various scaling options and the facility for applying either basic frequency cut-off filters or a custom-designed filter.

The program is supplied on disk in unprotected BASIC format. The program contains a machine language section which implements the fast Fourier transform (FFT) as a subroutine. The simple two-page instructions assume a great deal of knowledge about Fourier transforms and signal analysis; no sample problems or exercises are described, so you are really on your own.

While the material supplied is correct and details all the program's operations, it would be difficult to master without previous experience with signal analysis. The instruction sheet recommends several books for study. These are definitely college level engineering texts. The remainder of this review will focus on features with which the experienced signal analyst might be concerned.

Spectrum Analyzer is really a misnomer. The program only computes FFTs. Spectrum analysis usually refers to taking the log magnitude of the Fourier transform after applying a suitable window sampling function.

The program only computes transforms of fixed length (256). There is no provision for samples of other lengths. You are forced to pad the signal data with zeros. The input editor makes this process frustrating, since you must enter all 256 points (128 for a symmetric signal) before exiting the input section of the program.

The display is also bothersome at times. If you list the data to the monitor, the numbers are displayed as 10 complex pairs per screen. You must view all 256 pairs before exiting the display routine. Many times the numbers will cause the display to scroll so that you miss the heading and several lines of output. You can also send the display to your printer, or produce a high resolution plot on the monitor. The plot option is really the best way to display the data until you're ready for a permanent copy.

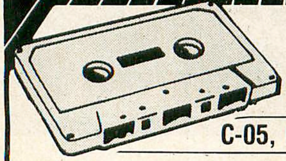
The program has a bug that surfaces when you use the screen display option. The section that produces the display prematurely exits a *FOR/NEXT* loop. This causes an NF Error to occur when you next try to scale the data. The instructions fail to mention how to recover from errors without losing data. I found that entering *GOTO 70* in the command mode will return you to the main menu. From there, most options will work correctly. This method will also allow you to rerun the program without waiting for the machine language FFT to be poked into memory.

Another small problem with the program concerns the user prompts. Many times it isn't clear when the program has gone off to compute, in response to keyboard input. This is particularly frustrating for the first-time user.

The program does compute FFTs correctly, and the machine language version certainly speeds the process. You could use this program to form the basis of your personal signal analysis library. However, it will only serve the needs of the serious experimenter with considerable modification.

(Ankia Research, 901-19 Indiantown Rd., Suite R, Jupiter, FL 33458, disk $19.95)

—Stuart Hawkinson



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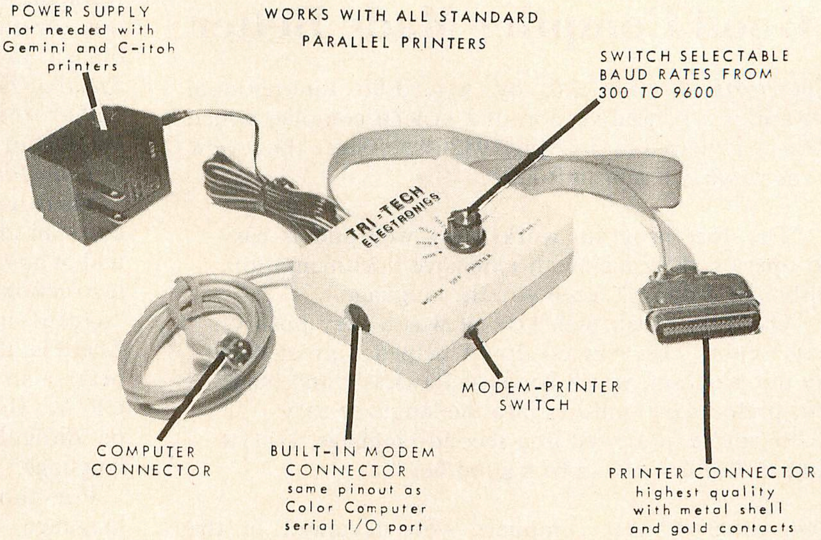
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Colorforth Version 2.0 — A Good Compiler Made Better

Colorforth Version 2.0, by Armadillo International Software, is a revised version of a FORTH compiler which RAINBOW reviewed in the May 1982 issue. Since the review was short, we will reprint it here:

> "The 16K program works very well and is easy to operate. It comes with extensive documentation, although it doesn't teach you the language.
>
> "Our first brush with FORTH was a very positive experience. This was no doubt helped a great deal by the program, which behaved flawlessly and made our preliminary ventures into the language easy.
>
> "If you're interested in a second language, FORTH and *Colorforth* would be a good bet."

Two other FORTH compilers were reviewed in the December 1982 issue of THE RAINBOW. *Color-Forth* (similar name), by Hoyt Stearns Electronics, comes in two versions costing $58.95 or $123, while *ccForth*, from the Frank Hogg Laboratory, is $99.95 and is available only on disk. Armadillo's program has a distinct advantage over the others in that, for $49.95, you get both tape and disk versions supplied on a single cassette. On the other hand, the more expensive programs contain a variety of sound and graphics routines not supplied in *Colorforth*. However, the nature of the FORTH language is such that you can create such routines yourself.

The instruction manual (82 pages, spiral-bound, 5½ by 8½ inches) clearly states that you will not learn FORTH from the manual. It recommends two books and points out several minor, but important, variations from the dialects taught in the books. For example, when the book *Starting Forth* tells you to write VARIABLE CATFISH, *Colorforth* requires 0 VARIABLE CATFISH. Similarly, WORD in the "standard" version becomes WORD HERE in *Colorforth*.

There is an introductory section that will give novice users an idea of command syntax (very heavy on spaces), and of how new commands are defined. Clear and complete instructions are given on how to make backups and save "screens" in which your source code and other data is stored. There is also a thorough description of the editor, which bears a strong resemblance to the ED text editor used in CP/M. But, most of the remainder of the manual will be difficult to understand unless the user knows the language.

For those who have some knowledge of machine language, instructions are given for incorporating ML routines into your programs so that you can have graphics, sound, control of I/O ports, etc.

The original *Colorforth* was a 16K program. *Version 2.0* requires a minimum of 16K, standard BASIC, but if you have 32K or 64K, it will take maximum advantage of available memory. There is even a provision to bank-switch the upper 32K in a 64K CoCo between RAM and ROM.

Version 2.0 also contains certain "vectored" words, and an optional faster LIST that the original did not have. "Vectoring" means that some words can be redirected where needed. For example, if you sometimes use a printer that requires an extra linefeed after every carriage return, you have only to type '<CRLF> IS CR when using that printer. You can also create your own vectored words.

For those without Extended BASIC, *Colorforth* contains its own *CSAVEM* command for making backups and storing data to cassette.

The word FREEZE allows you to install your own definitions so they will be in effect automatically whenever you load *Colorforth* from disk or cassette.

(Armadillo International Software, Box 7661, Austin, TX 78712, $49.95 plus $2.50 S/H)

— Neil Edward Parks

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Megamunk Offers A Challenging Spectacle

Megamunk is a strategic, arcade game which requires 32K of memory and is available on tape or disk. If you get the cassette you can follow the instructions to transfer to disk, which were included with my copy. It is a 100 percent machine language game in which you play the part of a soldier monkey sent on a mission by the king of Ledonia. In this daring venture you will see 11 different screens with multiple colors and four-voice music (then again, you may not see the 11 screens!).

This game is, to say the least, a real challenge. You must save the forest of Ledonia from the monster spiders of Dagath. To do this you need to fully cross all sections of the web with your monkey and be careful not to touch the spider. The spiders cannot be killed, only chased away. As you cross a section of the web it will turn from white to red, which means you have drained it of power and at the same time stored the power for your teleportation to the next web. Finally, when all the web is red the dangerous spider will exit quickly since the web will self-destruct. At this time you must rapidly move to recover the Treasures of the State, i.e., the signet ring, and then press your joystick button to depart to the next, more complicated web.

Simple you say? Wrong, dragonbreath! I forgot to mention that while you are climbing around, you must also chase away the sacred birds of the State that approach or land in the web. If they land, the spider will attack the birds and they will disappear. But, there is yet another danger! You must continually dodge the coconuts that keep falling due to your moving about on the web. A direct hit will do the obvious: kill your monkey. Fortunately, a glancing blow will only make you see stars. (The web has been spun between two coconut trees and that is the reason for the falling menaces.)

As mentioned earlier, you must not touch the spider or you will die. But, you must not let the spider get you, either. You have a limited cloak of invisibility, which, when your time is up, will let the spider see you and he will attack *you*, instead of the silly birds. And that is the last of the perils (as if that isn't enough!).

I will admit that I was not able to see all the screens through normal play; even with a trick which allowed me to see or get to the tenth screen, I was never able to go to the eleventh. I kept getting killed each time. For the trick allowing you to advance to higher screens, be sure to read the whole instruction book.

So if you relish a challenging arcade-style game, spending endless hours dodging coconuts and spiders, feeling the wonderful satisfaction of beating the computer and a well-designed game, then *Megamunk* is definitely for you. But remember, I warned you it isn't easy!

(Color Connection Software, 1060 Buddlea Drive, Sandy, UT 84070, tape $21.95, disk $23.95)

— Douglas Pirro

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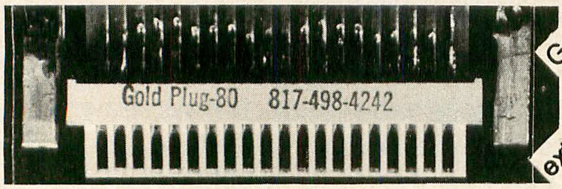

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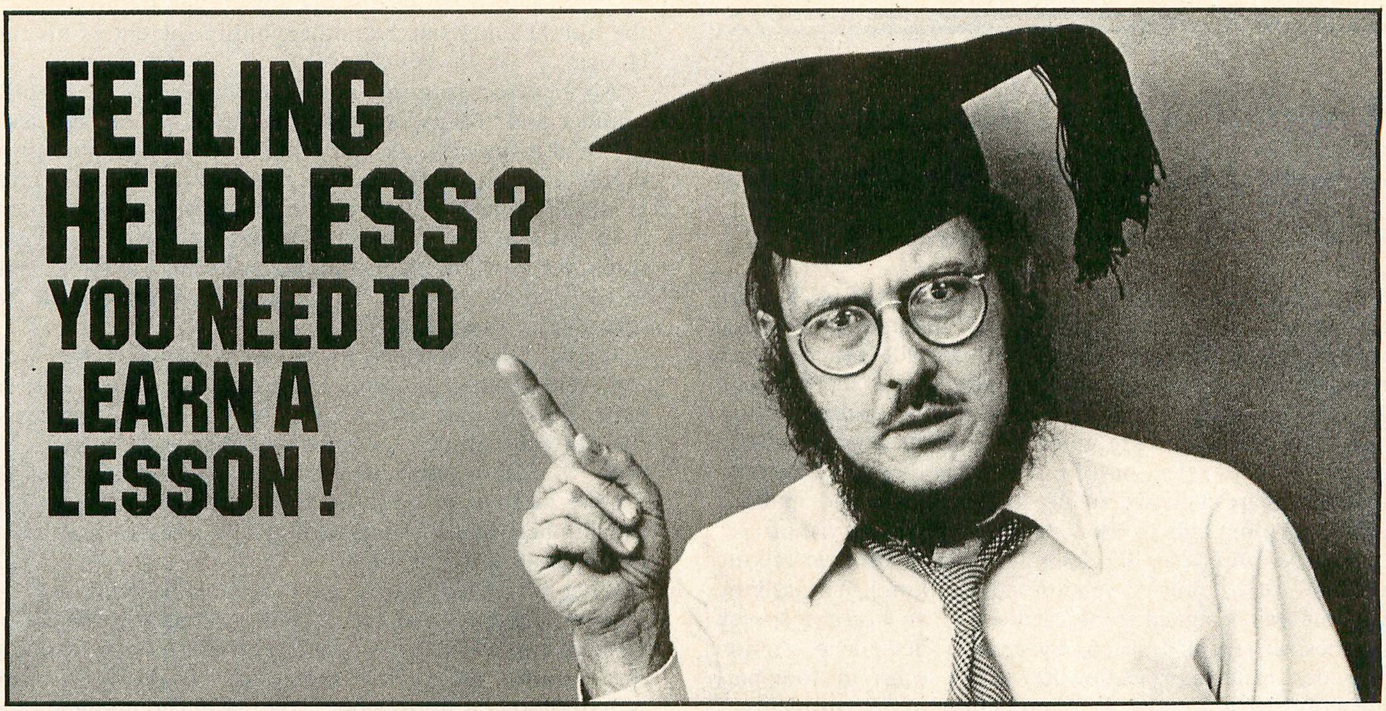

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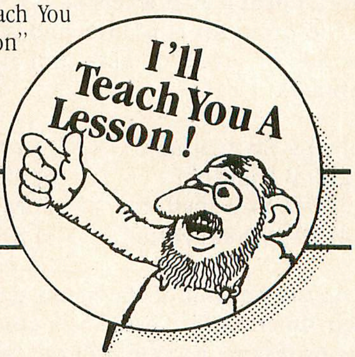
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Number And Color Words — A Good Early Reader Program

By Kenneth D. Peters

Number and Color Words, by CY-BURNET-ICS, is an educational program for preschool/kindergarten through second grade children designed to provide practice with recognition and spelling of the number words zero through 19, and the color words red, green, blue, orange, yellow and white. Rewards are given for correct answers, and a menu provides selection of eight levels of play. Together, they motivate a desire to use the program and make it easy for young kids to use with minimum supervision.

Number and Color Words is available in either a "talking version" or a "music" version (non-talking). The talking version was designed to be used with *The Voice*, a speech synthesizer from Speech Systems. The music version provides random selection of three songs in four-part harmony as a reward for completion of 10 problems. I have used both versions. The two versions are essentially the same, and therefore comments pertain to both unless otherwise noted.

Number and Color Words is loaded and auto-run by *CLOADM*. The program itself is in BASIC and contains a list-disable poke, so if you're someone who likes to see how the program is written or wish to modify the program, you will have to know how to restore the normal listing *(POKE 383,0)*. The documentation seems complete and is well-written. It suggests using a setting of 6-7 on the recorder for loading the programs. I encountered difficulty loading the programs at that setting, but would like to remind you that a recommended setting on one system may be entirely wrong for another. As it happened, I could not load the music version at any setting above 3-4, but had no problem at levels of 2-3.

The program is loaded and a menu appears with eight options or levels of play, not necessarily in the order of difficulty:

1) 0-9 Sequential
2) 0-9 Random
3) 0-9 You spell 'em
4) 10-19 Sequential
5) 10-19 Random
6) 10-19 You spell 'em
7) Match colors
8) Spell colors

At the bottom of the menu screen four special keys and their functions are listed as a convenience to help you with the program: ENTER, CLEAR, arrows, space bar. Use of these keys will be described shortly.

Pushing any number one through eight on the keyboard selects your level of play. I started my kindergarten daughter on Level 1, which I thought to be the easiest. On levels 1, 2, 4 and 5 a number word is displayed in the middle of the screen in large (one inch on a 13-inch TV) graphics letters, either sequentially or randomly, according to the menu selection. The student must then enter the correct numerical response. The number selected appears above the number word in a larger (one and one-half inch) graphics display as soon as the number is pushed. If the student decides the number s/he has chosen is the wrong number, s/he can push any of the four arrows to erase the number and select another, until s/he enters his final choice.

An incorrect response automatically erases the graphics number and "beeps" a quick error note. A correct answer gets and different note and removes one of 10 little trains at the bottom of the screen. The bottom of the screen is initially filled with 10 little train engines or locomotives (two rows of five each) with smoke bellowing from each stack. Removal of each train with a correct answer is part of the graphics reward. Perhaps this is suggestive of "the little engine that could?"

If the child doesn't know what number the word represents, s/he can press the space bar at any time for help. Help in the "music" version is a visual display of the correct number for approximately one second. The "voice" version provides a spoken pronunciation of the correct number in addition to the visual presentation of the number. The "talking version" utilizes speech as a help mode on all levels of play.

After all the numbers have been either randomly or sequentially used and the child has completed 10 correct answers, the child is rewarded with a selection of one of three songs, all having something to do with trains: "Chattanooga Choo-Choo," "Wabash Cannonball," and "Old Ninety-Seven." Unfortunately, the talking version of *Number and Color Words* does not have musical rewards. I say unfortunately, because both of my kids who used this program (ages 5 and 7) started out using the talking version. After quite a bit of coaxing, I convinced them to try the "music" version and was never able to get them to go back to the talking version because of the attraction to the musical rewards! They loved the music so much they would sway and dance in front of the computer. It would be nice if the programmer could combine the music and voice together in one program for those who have the Voice Pak, as the voice does have its advantages, especially for the younger children.

At *any* time and for whatever reason, the child can hit CLEAR and return to the menu, no matter where s/he is in the game. Let's discuss options 3, 6 and 8 of the menu. These will generally be for the older children in the range group, as my older son in second grade can testify, since they deal with spelling tasks. He thought matching colors and numbers with the words had been "easy," but spelling the colors and numbers was another story.

A numeral or a box of color is displayed at the top of the screen in inch and one-half characters, and the child must enter the correct spelling of the number or color word. Again s/he has every opportunity to erase the spelling using the arrows and correct it before entering it, or ask for help (space bar), or quit altogether by hitting the CLEAR button and returning to the menu. Help in the spelling options consists of displaying the correct spelling of the words for approximately one second, and if using *The Voice* the word will also be spoken.

The final option, 7, is Matching Colors. A color word is displayed in the center of the screen in one-inch letters. The child must match the word with one of four colored boxes numbered one to four at the top of the screen. My 5-year-old was a little upset with this option, as she couldn't read enough to match the colors, yet wanted to do it in the worst way! We ended up writing the color words on a sheet of paper using the color of the word to write the word. After a day or two, I noticed she was no longer using her paper!

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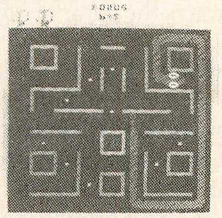

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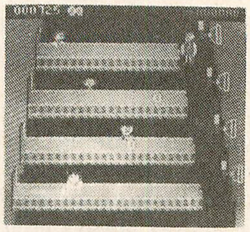

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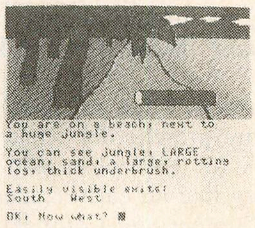

```
You are on a beach, next to
a huge Jungle.

You can see Jungle, LARGE
ocean, sand, a large, rotting
log, thick underbrush.

Easily visible exits:
South   West

OK, Now what? █
```

BLACKBEARD'S ISLAND

A brand new high res graphic adventure. This one will blow your socks off! Wander around Blackbeard's Island being ever mindful of the hazards while your lust builds for Blackbeard's buried treasure. T'aint easy, matey!

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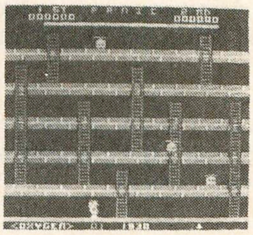

PANIC

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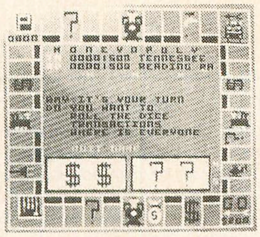

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Now! Play this popular board game on your computer. Probably the most realistic computer board game simulation ever. Contains all the features of the original. Buy, rent or sell properties and become a wealthy land baron with this program.

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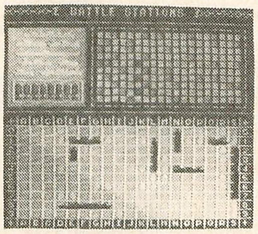

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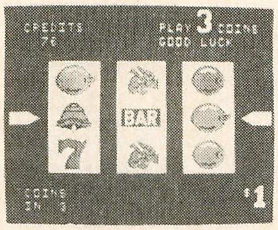

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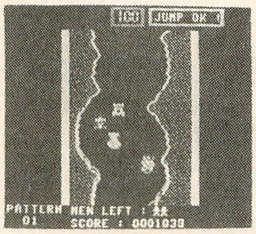
6 games



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I guess I would like to see a ninth option added, in matching colors, that would give a "color clue" for the children to help match colors with the color words. For example, the graphics letters used for the color words could be shaded with the appropriate color, or the little trains could be shaded with the correct color. Alternatively, the "color clue" could be incorporated into the help mode. For example, the letters could be shaded briefly with the correct color and then returned to normal. Currently, the help in this option is a small arrow that appears and points to the correct colored box for a second, then disappears. And, of course, the talking version says the color in addition to pointing to it.

Number and Color Words provides a good variety of options for children to practice recognition and spelling of number and color words. Not only is there a variety of things to do within the program, but each option provides a variety of excellent graphics and musical rewards. There is even an occasional change in the background color of the game's graphics screen. The trains also change colors along with the background change. In effect, a change of scenery occurs without changing the routine.

My only disappointment with *Number and Color Words* was going from the "music" version to the "talking" version and finding the musical rewards had been sacrificed for the advantage of the voice! Apparently both of my kids felt the same way since they have almost always used the music version. However, it is my understanding both versions are included on the same media if the talking version is purchased.

Aside from that, neither my kids nor I had any problems using the program. Watching my preschooler while she was trying to "read" the words for the colors and the numbers, I thought this was very like an early reader or "I Can Read" book. I decided *Number and Color Words* must be an early reader program. *Number and Color Words* is very easy to use and provided hours of entertainment and learning for the kids.

(CY-BURNET-ICS, 5705 Chesswood Dr., Knoxville, TN 37912, 32K ECB, cassette $29.95, disk $32.95. Add $5 for Talking Version with copy of Music Version)

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Make Cassette Backups From Disk With *The Archivist*

By Frank J. Esser

How many times have you lost a disk only to find out that the backup either could no longer be read or for some reason no longer existed? It has been known for a long time by the computer industry that magnetic tapes provide one of the best long term backup media. They can be stored in environments not as strictly controlled as those required for long term floppy storage. How does all this affect the Color Computer? Well, the Color Computer can access a cassette recorder; although it is not a 9-track magnetic tape unit, it will work very well. *The Archivist* program, from Sonburst Software, will give you the ability to make those backups to cassette tape and not have to worry about the type of files on the disk. As far as I could tell, *The Archivist* handled all types, including BASIC data files.

The Archivist comes on a 5¼-inch diskette and includes a spiral-bound instruction manual. The diskette comes write protected, but can be backed up using the standard disk BASIC *BACKUP* command. *The Archivist* is a machine language program which will take the contents of any disk and back it up to cassette tape. It will also restore any disk it has backed up. Thus, it gives you the ability to keep tape backups of your important software and do it quite easily.

The Archivist also allows for the placing of a 256-byte information block on the front end of each cassette tape. The purpose of this block is to provide information about what is stored on the rest of the tape. *The Archivist* will read this block first from the tape and display it for you before going on with the restore function. With the proper use of this block, it becomes unnecessary for one to search the entire tape to determine if it is the right one or not — a very neat feature. The disk I received for review contained six programs, four of which were copies of the other two.

The manual is broken down into seven chapters. They are: 1) Variables List, 2) Warranty, 3) Introduction, 4) Instructions, 5) Examples, 6) Question and Answers, and 7) Index.

The variables list is not what the name implies. *The Archivist* has the ability to perform two very important functions besides backing up and restoring diskettes. It has the ability to change the disk stepping rate to six, 12, 20 or 30 ms. It also has the ability to double the speed data that is sent to the tape recorder. The variables list section shows how you can modify the BASIC loader to set both the stepping rate of the drives and the tape recorder. You are warned that the double-speed will not work with all recorders. The CTR-80 and CCR-81 sold by Radio Shack are recommended if double-speed is desired. I own a CTR-80 and tried it at double-speed and had no problems whatsoever. I also have MPI and Tandom disk drives, and set them up for a step rate of six ms. All worked very well.

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The chapter on warranty explains the exact terms under which the software has been purchased and the purchaser's responsibilities. They go into great detail, which leaves little room for confusion or misunderstanding.

The introduction tells how to get the program up and running, and just what the terms are that are used throughout the manual: terms such as upperleft, subject, next line and escapes. Again, the change in speed parameters is explained. It is also mentioned that a full disk can be backed up in nine to 11 minutes using the tape at double speed. Not bad in the time department. Also, typical errors that might be encountered are explained and what should be done about them.

The instruction section takes you through the process for saving and restoring a diskette to cassette tape. Typing *RUN AR* gets *The Archivist* up and running. You are presented with a menu requesting you to enter one of the following:

D — Presents the directory in the default drive and allows killing files or alphabetizing the entire directory.
A — Presents archive and format menu of four choices
    1) Erase and format the disk
    2) Verify the tape copy
    3) Disk to tape archive
    4) Tape to disk restore
U — Allows the selection of the default drive.
V — Toggles verify write operation off/on. The verify operation is the same as disk BASIC's *VERIFY* operation.
T — Allows input of today's date in MM/DD/YY format. The date appears as the first bytes in the message buffer for later reference.
K — Toggles the keyclick off/on.

Selecting the 'D' response will get you into the Directory function. You will be presented with a listing of the directory of the disk in the default drive. Using the arrow keys, you have the ability to scroll through the entries. Pressing the 'A' key will sort the directory entries in alphabetical order. At this point the directory on the disk is not replaced. Using the arrow keys and positioning to a directory entry, then pressing the CLEAR key will kill that file. Again, this is only done to the memory directory. Pressing 'W' will write the memory directory back to the disk in the default drive. If you make a mistake and kill a file you do not want to kill, all you have to do is exit this section and reenter it. The old memory directory will be destroyed, will not be written back to the disk, and upon reentry a new memory directory will be built.

The examples section of the manual will walk you through both a disk to tape backup and the reverse process, a tape to disk restore. The examples are straightforward and easy for almost anyone to follow. Once through these examples no one should have any trouble running the programs. They are that simple and easy to use.

The question and answer section is sort of a technical section. The people at Sonburst Software used this method to put forth the more technical details of the program. Such questions are: "How is the tape formatted?", "What is a sector, track and gran?", "What is a collated backup?" and so on. This section is a somewhat novel way to explain the inner workings of your software.

The Archivist does everything it is advertised to do and more. It performs very well. I backed up seven of my full disks and had absolutely no trouble recalling them, and all programs worked after the restore process. The format used by *The Archivist* is such that you can only place or perform one backup on one side of a tape. But, when you think about it for a minute, you really don't want more than one on a side; it sort of defeats the purpose of the header block. A full disk, one that has all 68 grans allocated, would not fit on one side of a 30-minute tape, but would fit on one side of a 60-minute tape.

The Archivist works very well, is reasonably priced and provides an excellent manner to back up your disks onto a good storage media without regard to the type of file or files on the disk. It would be an excellent addition to any library.

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Workbase — An Excellent Database Management System

By Frank J. Esser

Today there exists a number of database systems for the Color Computer. Some of them are quite simple to operate but are not as flexible as one would like. Others require more time to learn to operate them, but in return offer greater flexibility. The more complex a program is, the longer it will take to become familiar with it. Please notice I did not say the more complex a program is, the harder it is to operate. That simply is not always true.

Workbase is a database management system, which is somewhat complex in nature, but very flexible in its uses. The most flexible portion of *Workbase* is the report section. It is possible to easily produce a report, in almost any format you desire. Most database systems will provide you with a columnar format. That is, you can produce a report in which the data stored in the database is displayed in columns with the data field name at the head of each column. *Workbase* can do this also, but it has a custom report section, which allows you to format a report in almost any way you want. It even allows you to create form letters, using your database to extract the needed names and addresses. The entire section is very well done and really has to be seen to be appreciated. The entire package, from the programs to documentation is well done. I fell in love with *Workbase* and think it is a real winner. It is not as full blown a database manager as one might find on a larger machine, but it sure doesn't fall very far short.

Workbase comes in two levels, *Workbase I* and *Workbase II*. Since *Workbase II* is essentially *Workbase I* with the ability to handle larger databases, this review will cover *Workbase* and the differences will be listed at the end. *Workbase II* comes enclosed in a three ring binder. The documentation is subdivided by functions with each of the system menus receiving its own section. Thus, if you need help with any given menu, it is easy to find the section explaining it. The system comes with two diskettes — a system and a demo diskette. Both diskettes can be backed up using the standard BASIC backup command. The documentation was produced on a matrix printer with free use made of the elongated print and overstrike features. The demo diskette contains 10 sample databases and associated report files. Each of these sample databases is fully explained in the introduction section along with the file layout and the report formats. The introduction section also contains an overview of the entire system and what it will do for you in more general terms. *Workbase* requires a 32K Extended BASIC computer with at least a single disk drive and a printer. *Workbase* supports the following printers:

Epson—Gemini—LPVII—DMP100—LPVIII—
DMP—200—NEC—Prowriter—Okidata 83A

If you do not own one of the above printers, *Workbase* has provisions to add two additional printers without disturbing the above list. If you should need more than that, for some reason, then simply delete one of the above listed printer codes and substitute the one you want. The entire process is quite simple and easy to do. Just another example of the extra steps taken to make *Workbase* a good solid system. The introduction section also describes, in detail, the different types of data formats supported by *Workbase*. The data types supported are:

Amount — is limited to nine digits, with two decimal places and will always appear with a dollar sign and decimal point.
Other — is the same as the amount data type except a dollar sign is not used and it has three decimal places.
Integer — used for numeric data fields that do not require a decimal point.
Date — used for storing the date in the format of mm/dd/yy and will always be printed in this manner.
Clock — used to store the time of day in 12 hour notation. The format is hh:mm AM or PM.
Phone — used to store a seven digit phone number and will be stored in a format of xxx-yyyy.
Text — used to store any type of data and can be from one to 255 bytes long. The length is specified at definition time.

Workbase is activated by placing the system disk into drive 0 and typing *RUN "WORK"*. Once *Workbase* is loaded and running, it enters the initialization or system definition stage. You will be asked the number of drives your system has. If you respond with two, you will then be instructed to remove the system disk from drive 0 and place it in drive 1. One of the faults I found with *Workbase* was the inability of the system to determine what drive the original module was loaded from. Thus, if you leave *Workbase* for some reason, you will be required to move the system disk from drive 1 to drive 0. *RUN "WORK"*, answer the number of drives prompt, and then move the system disk from drive 0 to drive 1 and continue. It is not a major point, since it does not affect the running of the program, but it sure would have been more convenient if the system disk could have remained in drive 1. You will now be asked to identify the type of printer you are using, or if you wish to add a new printer or change a given printer's codes. If you are using one of the predefined printers, then enter the number that corresponds to your printer, or a 'D' to define a set of or modify an existing set of printer codes. Once that has been accomplished, you will be asked for the printer Baud rate. Simply enter the number corresponding to the set Baud rate of your printer. With this complete, *Workbase* is ready to go to work.

Workbase is divided into nine major sections, each section being selectable from the main menu. These sections are:

1) Data Management
2) Calculations
3) Standard Report
4) Custom Report
5) Utilities
6) System definitions
7) Conversion
8) Quick Edit
9) End

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The Data Management section of *Workbase II* is the heart of the system. It is through this section you will create your database files, edit or update existing files and reorganize existing files. Each of these sections has its own submenu that will guide you through its use. The menus are easy to read and a little tricky to get used to, but once you have them mastered, life becomes very simple. After I got over the initial familiarization cycle, I found that I had all the options I could desire available to me. This section is really well done and requires some getting used to, but the time is well spent. "Update a file" allows you to look at given records, or scroll through the database a record at a time. Each record is displayed and you have the opportunity to modify any of the fields in that record before it is put back. "Reorganize a file" gives you the ability to add, change or delete data field definitions. Suppose you wanted to add a data field to your database that you forgot when the file was created. Using this section, that forgotten field can be added. From this section, as well as others, a directory listing can be obtained from any of the drives.

The Data Edit section supports adding new records or data fields, changing a data field or record value, deleting a record or data field, listing a data field or record, initialize/clear a record or data field, select a data field or record, change the title line, move a data field or record, sort records or data fields, print records, calculations, copy records, end session and display file characteristics. The add, delete, list and initialize functions can be performed at either the record level or at the data field level. Thus, all one type of data field could be deleted or initialized/cleared through one command. The move command allows you to alter the order in which the records will be displayed if a sort has not been run, and also the order in which the fields will be displayed. Normally the fields will be displayed in the order in which they are created. The sort command allows you to define the order in which records will be displayed, according to the fields sorted on and the type of sort used. I was able to get a three level sort to function quite nicely. I am the secretary for a Friday night couples bowling league. I set up a database and entered the roster. Using the sort routine, connected with the report facilities, I was able to sort the database on the team number, the last name of each team member, and then the first name of each team member. It worked perfectly. I was really impressed with the ease with which all this was accomplished.

The Calculation section provides the ability to update a database through calculations on fields contained within the database. A calculation in *Workbase* is entered in the form of a simple formula. The first step requires identifying the data field in which the calculation is to be stored. The following format is used.

Result = Operand (operation) Operand (operation) . . .

Net Amnt = Extnd Amnt + Tax + . . .

The supported operations are add, subtract, multiply and divide. Once the calculation procedure has been entered, it can be stored and executed. Thus, it becomes a part of the data disk, ready to be used at any future time. The procedures can be listed to the printer or screen. They can also be loaded, modified and saved.

The Standard report section can be used to produce reports which consist primarily of columnar data. Standard reports contain parameters describing multiple reports as well as the record selection and sorting requirements for each report. Each report defined in a standard report consists of 14 BASIC options. Some of these options are page length, page width, top margin, normal or compressed print, print record names, print data names, key data name and page per key value. From these options I think you can start to get the idea of the flexibility that has been built into the *Workbase* system. The standard report section has all the features necessary to create, save, load, edit, print and execute the report procedures. With the given options it is very easy to put together a report procedure which will handle label printing for a mail list database. The quality of reports that can be produced is striking.

The Custom Report section is used to produce those reports that cannot be handled by the standard report section. A custom report procedure consists of several report/documents as well as record sort and selection criteria. Each report included in a custom report procedure will print once for each record in the database. Multiple copies may be printed for any report. Multiple report/documents can be merged to create a report. Available to help you create your document procedure is a full screen editor which will edit a buffer of 2400 characters and has excellent cursor control functions. The custom report section also has all the features necessary to create, save, load, edit, print and execute these procedures. Also you can get a draft copy of the report. You can get a printout of how the document/report will look without having to run any actual data through it. The data fields you wish to be printed in the report/document are enclosed in "/ /" marks. Thus, suppose I wish to create a form letter using a mailing database. I might start out with:

Dear Mr. / /LAST NAME/ /

For each record in the database, the text stored in the data field LAST NAME would be placed between the / /. Using a figure of 80 bytes per line, 2400 bytes would allow for 30 lines if each line required a full 80 bytes. Usually this is not the case and a full page of 66 lines can usually be accomplished without too much trouble. The manual fully explains, in plain language, the cursor control functions that are available and the accepted embedded printer control codes. Some of these printer codes are: advance to next line; advance to next page; right justify; double space; quit printing; tab; set left margin; double width print; compressed print; emphasized print and overstrike. All the functions found in most word processors. These features are enough to turn an average report into something that will demand attention. The editor functions included full cursor control, jump to beginning or end of line, jump to top or bottom of screen, print the screen, jump backward/forward a word, scroll up/down a line, scroll up/down a full screen, jump top/bottom of document, enter insert/delete mode and end text editing. Again all the functions one would expect of a full word processor. All of these printer codes and editor functions are available for you to use when creating your custom report/document. A really impressive addition.

The Utilities section provides the following utility functions: generate a new file; merge files; copy files; update files; summarize numeric data fields; kill/delete a database file; rename a database file and post numeric fields to another file. The generate utility will create a new database file from an old database file. However, the new file is not a simple copy of the original file. Only those data fields and records selected are moved to the new file. This utility can be used for a number of purposes which include an accounting database for a new period or the framework for a new file. The merge utility will move data from file 1 to file 2, extending file 2 in the process. Only those fields and records selected will be moved to file 2. Data fields must match between file 1 and file 2 in terms of the data field names and data type. The copy utility will copy a file using the standard BASIC copy command. With this utility you can make a backup copy, which is a mirror image of the original. The update utility is used to update matching fields from file 1 in file 2. The summarize utility will total the selected records and create a record for storing the totals. A separate total record will be created for each value of the data field identified as the key. The delete and rename utilities are identical to the BASIC commands of kill and rename files. The post utility will summarize selected data fields in file 1 and the totals are used to update matching data fields in file 2. Each record in file 2 which has a matching record in file 1 will be updated. A single data field or record name is used as the key for matching records between the two files.

The Quick Edit section allows you to perform the following functions: add a record; change a data field or record; list/display a data field or record; select a data field or record; enter calculator mode; sort records or data fields; print records or data fields selected and list file statistics. These options are similar to those in the Data Management section except they are more limited and a little faster to use. All else remains the same.

The conversion section is used to convert a *Homebase* database to a *Workbase* format. The conversion process

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includes reformatting and compression of data records so it is possible that after the conversion process additional free/unused records will be available.

I purchased my Color Computer in August 1982. At that time there just wasn't much available for the Color Computer in terms of word processors and database management systems. I have watched the level and sophistication of the software continue to grow until there are now first rate packages available. One of these packages I think is *Workbase*. I had originally done the review on the *Homebase* database management system, published in the March 1983 RAINBOW, so I was familiar with the concepts of *Workbase*. However, with the added functions and the level of the report capabilities I think a good program just got a lot better. As with any database management system, *Workbase* requires that time be spent on learning its ins and outs before tackling any serious applications. Also one needs to spend some time defining just what it is that he/she wants to accomplish with *Workbase*. Through the utilities, errors in the original design can be accommodated and corrected; it is much easier to eliminate them before beginning. But once these steps have been mastered, the database manager is a pleasure to use. It is error forgiving and error trapping is used where possible. The programs, and there are many, are written for the most part in BASIC. My experiences were that if the programs had an error it was due to a bad file (most likely due to not exiting the programs properly). Once I got over the primitive learning stage I had no problems whatsoever. I was impressed with the ease with which I could get data in and out of the database. The programs are well done, the menus are clear and easy to read, the documentation is easy to follow and the options are excellent. I believe *Workbase* to be a system of good design and very well written programs that perform in a similar manner. On the other side, there are a couple of improvements that I think would make *Workbase* just a little more versatile. I think it would be nice if the print process could be interrupted and stopped or resumed by the user. Thus, if for some reason, the data being printed was not wanted, you would not have to wait for the process to complete before continuing. Also, you are required to place the system disk in drive 0 to load the initial program. If you are using two disk drives, like I do, then midway through the initialization process you are asked to move the system diskette to drive 1. If, for some reason you leave *Workbase* and return, you must move the system diskette back to drive 0 and repeat the process. The drive number last accessed is available in low memory and could be used to force load all other modules from that drive. The last and final suggestion is to force exit through the warm start procedure of the BASIC interpreter. As it stands now, you must either power cycle the computer or perform the following to rerun *Workbase*. You can force the interpreter through the warm start procedure by *POKE 113,3:EXEC 40999*. Other than those few items, I think that *Workbase* is a database manager of very good quality and reliability. Once I got over the original learning curve, not once did I crash the system. And I am not known for my excellent typing skills. The difference between *Workbase I* and *Workbase II* is the number of records allowed in any one file. *Workbase I* allows for a maximum of 400 records while *Workbase II* allows for 1200. I think the Color Computer and *Workbase* make a winning combination.

(Workbase Data Systems, P.O. Box 3448, Durham, NC 27702, *Workbase I* $64.95; *Workbase II* $79.95)

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One-Liner Contest Winner . . .

Richard Carey says that "this program has two purposes: 1) creates random music, and 2) drives little brothers up the wall." That may well be true.

Richard Carey
Marshall, TX

The listing:

```
0 T=RND(-TIMER):P=RND(255):FORX=
P TORND(255)STEPRND(5):SOUNDX,RN
D(5):NEXT:RUN
```

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Simulations* and its companion *Rainbow Simulations Tape.*)

Versa Mail Features Efficiency And Versatility

By Eldon Doucet

Do you have a need for a good mailing list program? Well, you've come to the right spot. *Versa Mail*, by Computerware, is a very versatile mailing list database. It requires a 64K disk system and a printer (80-132 column). It has the ability to span up to four drives to store a database on. This adequately gives a capacity of over 2,500 records per file with four drives; over 800 with just one drive. I found one drive to be plenty, as any mailing list I have is less than 200 names.

Versa Mail stores the first name, last name, address, company, city and state, ZIP code and phone number for each record produced. You also have the option of creating 12 additional fields. These fields are given a title by the user up to eight characters long and can store any kind of data up to 20 characters long. The more space used for each record by adding more fields will cut down the number of records that can be stored on each disk.

The manual is well-written and leads the user through the program quite effectively. The first thing to do to set your database is configure it. This involves setting the Baud rate of your printer; defining compression and uncompression codes for your printer, so that an 80-column printer can use 132-column print, and switch back; defining any additional fields for each record; allocating disk space to be used to store text files for "mail merging" them with your mailing list, and for label formats used to print mailing labels from the database; defining how many records the database can use, and on which drives; and setting the date. Most of the items that are configured can be changed when the main program is running by selecting a specific menu item. The ones that can't be changed are the extra fields set up initially.

Once the configuration process is complete, you can move into the main program which has the following options: Add Record; Delete Record; Change Record; Display Record; Print Listing; Print Labels; Mail Merge; Utilities/Defaults; and Return to BASIC. The menu screen also shows how many records are currently in the database, the maximum allowed, and the last date the database was used.

All input screens are user-friendly and have default answers which can be used by hitting ENTER. They also give the option of changing anything before any action is taken. For example, on the first screen when adding a record is completed, a prompt asks which field to change, or hit ENTER if none are to be changed. Prompts like this are throughout the whole program — a good feature since it also prevents an accidental erasure of a record in the Delete Record section. One nice feature of *Versa Mail* is that a deleted record can be "Unkilled," provided the record number is valid (all records have numbers), and you have not yet exited the program.

Display Record has some very nice features incorporated into it. Since all the records are automatically sorted as they are added, a sequential search of the database produces an alphabetical display starting at the name you choose (last name only). But two other displays are available. One is a Soundex search, and the other a Logical search. The Soundex search is unique, and I have not come across it anywhere else; it allows you to find records that sound similar to the name or word you are looking for. For instance, the names "Jonson" and "Johannsen" would both be displayed if you use the name "Johnson" to search by Soundex. The other search, Logical, is more familiar, especially if you have used a database program such as *VIP Database*. It allows you to select records based on a logical code, for example, as field #6 equal to California. You would type 6 EQ CA, and the program would find only records where field 6 equaled the letters CA. The other qualifiers are GT (greater than), LT (less than), NE (not equal to), GE (greater than or equal to), and LE (less than or equal to). The only thing missing from this search is the ability to *AND* or *OR* one field with others.

Printing can be done in several ways. A wide listing of records can be produced, using the compression codes that were previously defined; a short or long listing can be produced, i.e., the programmed fields can be printed or not; and records can be selected for printing using the selective criteria from the display routine. Another printing feature is the mailing labels. Labels from one to 12 lines and either one- or two-wide can be used. All of the main fields can be used and up to three of the programmed fields. In place of a programmed field, you can define straight text to print on the label on any line. The label format is saved as a separate file (which is why you reserved space in the configuration program). An alignment label can be printed first, and the records to print on labels can be selected using the selective criteria from the display routine.

Mail merge is a feature I've also seen before and is very handy. A form letter can be produced by any word processor capable of producing ASCII files, and space can be left to insert data from *Versa Mail*. Any field can be inserted anywhere in the letter and the manual describes this feature fully.

A file can also be expanded at a later date by adding a disk drive. *Versa Mail* will not increase a file on a disk it is currently using, but will allow more drives to be added to the database.

Versa Mail is an excellent mailing list database with plenty of features to boot. A 64K disk system may not be in the hands of everyone yet, but here's another excuse to get it!

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Space Escape Offers Two Great Adventures In One

Space Escape is another great BASIC Adventure on tape from Pal Creations. When you buy one of Pal Creations' 32K Adventure programs, you have a selection of more 32K Adventure programs to receive as a free bonus. Usually, a free program means a sloppy job that is only meant to entice you to buy the company's product. Well, *Eno,* one of the free Adventures from Pal, is just as good or better than *Space Escape.* Both run in 32K, but if you own a disk system, you'll have to unplug it because both programs use up all the available memory and just won't run with a disk configurated system. Perhaps if Pal compiled their BASIC programs into machine language they would use less memory and run on a disk system. Otherwise, the programs are fine the way they are. I'd rather unplug my drives than play an edited version of either Adventure.

First, I'll describe generally what can be said about both programs, then go into specifics. Both programs are terribly hard Adventures (all the better). They list all of the possible commands available, and you don't have to memorize them or write them down. If you type in an invalid command, the list of vocabulary words will be displayed. Now to the specifics.

In *Space Escape,* you have been taken prisoner by an alien UFO. You've been poked and prodded for many days now, but today you haven't been bothered, and your door has been left open. When you leave your room you find a control panel with 16 symbols on it. You will find a tabloid with a key as to what each symbol stands for. The symbols are the names of planets. When you push one, the forward wall rotates (all directions are in terms of forward, aft, port and starboard, instead of traditional directions). It seems the control panel operates a "rotating jail." The cell is either facing the opening or it isn't; only one cell can be opened at a time, preventing a mass escape. When examining all the cells you will find many strange enemy creatures. All dead, but not all harmless. You will also find an android named Noxol with one eye torn out. He is nonfunctional, as well as Zoxol, a robot you will find.

To escape you have to activate Noxol and Zoxol. Both will follow simple commands such as Follow, Stay and Destroy. While you explore the ship you must find a device that lets you translate the alien language, because there are clues everywhere written in alienese. There is even a clue on a monitor screen in a laboratory (I wonder if it's a CoCo!). There is another alien still alive on the ship. All the others were killed by a disease brought from Earth when you were picked up. To win, you have to leave the ship and return to Earth. I was eventually able to leave the ship, but I was stranded on an asteroid for eternity.

Eno has a totally different setting. You have an eccentric aunt who died and left you a fortune — you only have to find it. Clues are given which you have to decipher. The directions give the clue that the money is hidden in the living room. This is a lot of help since the entire Adventure takes place in the living room.

This Adventure is written with a humorous note. It is such a hard Adventure I didn't come close to solving it. I did figure one thing out: there is a safe behind a picture of a black cat (how classic). If you try to open the safe, and don't type in the correct numbers, you will be arrested because you set off an alarm. I won't give away all the funny things you will find in this Adventure, but if you go to the NE corner of the living room, you will see a large fishtank. If you aren't careful, you'll break it and drown. The program then tells you it was a very large fish tank and that you should have listened!

Both *Space Escape* and *Eno* are excellently written. Any program by Pal Creations means great Adventure. This is a fine product and worth purchasing.

(Pal Creations, 10456 Amantha Ave., San Diego, CA 92126, cassette $14.95)

— Scott Sehlhorst

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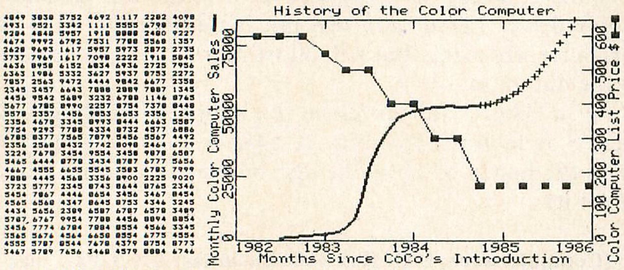

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Software Review

Expand Your CoCo's Vocabulary With *The Enhancer*

By C.L. Pilipauskas

A software utility is just a tool, like a screwdriver or a saw. Everybody needs a screwdriver (how else could you hook up your CoCo to the TV?), but not everybody needs a saw. Since a utility is a tool, you'll have to decide whether or not you need it and, hopefully, I'll give you enough facts here to decide.

A recent arrival on the utility scene is a program called *The Enhancer* from H.D.R. Software and written by David Skoll. It "enhances" Extended Color BASIC on a 64K CoCo by adding nine new commands and one new function. The program is available on cassette or disk.

The disk I received auto-executed after *LOADMing* it into memory. I was greeted by both a new copyright notice and prompt. I barely skimmed the five-page manual before typing in my favorite test program *(10 PRINT"HELLO WORLD", 20 GOTO 10)* and running it. It worked just fine. Now back to the manual to see what this program could really do.

Here is a brief summary of what I found.

1) RECOVER — use this when you mistakenly type NEW before SAVE and want to recover your program.
2) REPEAT ON (or OFF) — turns on the key repeat mode. Holding any key repeats it — FAST. (I thought it started repeating a little too soon.)
3) BREAK OFF (or ON) — disables the BREAK key to prevent accidentally crashing your program. It can still be used from your program as it returns an ASCII 6 when pressed.
4) DESPACE — removes all spaces from a BASIC program; be sure to have another copy of the program saved as the EDIT and ASCII SAVE may not work. A long program may take three minutes to "despace."
5) KEYDEF — defines keys 'A' through 'Z' as special keys when used with the control key (down-arrow). Each key can represent up to 100 characters. The author preprogrammed each key as a BASIC keyword (like D.A.+E=EDIT). Unfortunately, there is no way to save them for future use.
6) HIPRINT ON (or OFF) — this is the heart of the utility - TEXT WITH GRAPHICS, allowing 32 columns (or characters) in 24 rows to be displayed on a *PMODE 4* screen. It even has true lowercase letters but no descenders; 90 characters are defined.

The last three commands and the one function can be used only while HIPRINT is active.

7) CURSOR — replaces the *PRINT* @ function on the Hi-Res text screen.
8) SCROLL — scroll protects from zero to 22 lines at the top of the screen.

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9) CUSTOM — allows you to define your own character or even your own character set. Unfortunately, there is no way to save them for later use.
10) CHAR — is a function that returns the ASCII value of a character on the Hi-Res text screen, much like PPOINT is used for graphics.

Though the manual is only five pages long, anyone with a little experience in computers should be able to figure out how to use these features. I would like to have seen some sample programs using all the HIPRINT options as that would have made it easier to understand.

Unlike some other programs I've used that put the BASIC ROMs in RAM, this one is Reset proof. It also loads itself into the upper 32K of the memory map, so it uses virtually none of BASIC's RAM space.

The only "bug" I found was getting an ?AO error on the first *LOAD* after *The Enhancer* was running. A second *LOAD* or *DIR* works fine.

There are several things I would like to have seen done differently or better to enhance *The Enhancer* program. The inability to save redefined keys and characters is, in my opinion, a major flaw. The density of the text characters on the Hi-Res screen is a little disappointing, especially considering the state of the art with other programs. Without descenders, some of the lowercase letters took awhile to recognize.

As just a reminder, writing programs that use the features provided by *The Enhancer* can be run only while it is active. Also, some graphics games I loaded apparently interfere with this program while in HIPRINT mode; this is not a problem, just a warning. This program was also Copy-Backup protected, but can be replaced if damaged (but not tampered with) by sending back the original plus 50 cents to cover postage.

I received version 3.0 of *The Enhancer* from THE RAINBOW, and spent about three weeks testing it and writing this review. In response to a letter I sent to Mr. Skoll concerning pricing, I received an updated revision of this program (V4.3). There are several changes to the program and the manual. Time didn't permit me to test the new revision as thoroughly as the original and I'll just mention the new features:

1) New cursor — a black blinking square.
2) An expanded character set for HIPRINT (now 223 characters) which includes graphics, Greek letters, etc.
3) One more new command — SWAP which quickly exchanges two BASIC variables.
4) Information is now included on how to use *The Enhancer* with ML programs.
5) A complete ASCII table for the character set is included in the manual.
6) It will now run on both the original CoCo as well as the new CoCo 2.
7) The program is copyrighted by H.D.R. Software.
8) Underlining and bold characters are now available in HIPRINT mode.

All in all, I found this program to be well thought out, with the exception of the inability to save the redefined keys and characters. The program functioned as described in the manual and, if you write a lot of BASIC programs for your own use, *The Enhancer*'s features could make your tasks a little easier.

To enhance or not to enhance . . . I'll leave that up to you!

(H.D.R. Software, 27 Doyle St., St. John's, Newfoundland, Canada, A1E 2N9, tape $18.99, disk $22.99; make check or money order payable to David Skoll.)

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SOLVE Remedies OS-9 Blues

Are you sick and tired of that Debug module that is packaged with OS-9? Does the standard assembler Radio Shack supplies give you fits? Do you wish you had a disassembler for OS-9 that supported symbolic disassembly? Are you still reading these questions? If your answer is "yes" to any of these questions (except possibly the last one) then chances are *SOLVE* (Symbolic Object/Logic Verification and Examination), by Dugger's Growing Systems, is probably meant for you.

Although the full name is slightly more involved than piloting the space shuttle blindfolded through an asteroid belt, the program is very easy to use and operate, assuming that 6809 machine language is already familiar territory. The purpose of the debugger/assembler/disassembler is to allow program development and debugging in the OS-9 machine language environment. *SOLVE* serves this purpose quite well and effectively replaces the OS-9 system Debug and Asm modules, and some of the duties of the Edit module. Also note that *SOLVE* is completely memory resident, and is one large integrated package, so the large amount of file transfers normally required to develop a program is virtually eliminated.

SOLVE serves as a Monitor and a Disassembler/Assembler. To get a better perspective of each of these aspects, I will evaluate them separately.

The Monitor command set controls the manipulation of the stack, memory and registers. Commands included are:

M — Display Memory
C — Examine and Change Memory
F — Fill Memory
? — Search For Bytes
X — Transfer Memory
= — Calculate Expression
: — Examine and Change Stack Contents
B — Set and Display Breakpoints
K — Kill Breakpoints
@ — Change Current Nest Level
N — Set Maximum Nest Level

Commands included for execution and simulation of execution are:

L — Link to Module
E — Prepare Module for Execution
T — Trace Program
G — Jump to Program (Unmonitored)
S — Simulate Program

As one can see, this is a very complete command set for any monitor, and probably one of the best available

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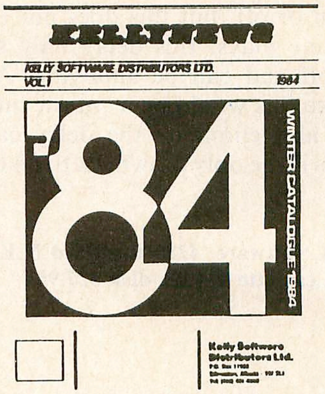
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for the CoCo. Although most of these commands are self-explanatory, some require further elaboration. The "Search for Bytes" command, or '?', is very helpful if a particular byte pattern is known, but the exact location is not. The search can locate patterns up to 16 bytes long which will probably accommodate any needs.

Another very notable command is the Simulate program, of 'S' command. This command allows the program to run at about six to seven percent of its normal speed, while the debugger traces the program and its register contents. Conditions can be set up for the cessation of the simulation, which include setting the number of instructions to be executed before termination, setting values for the registers to be at before halting, setting an address to halt execution upon, and many others. This command is very useful in the debugging process, and possibly the best designed program simulation function I have ever used.

The Disassembler command set is quite compact, and I will consider the miscellaneous commands part of this set for convenience's sake. These commands are:

A — Assemble
P — Print Symbol Table
D — Disassemble
$ — Pass command to OS9
Q — Quit
! — Set Program Base Address
< — Set Data Base Address

These commands are fairly straightforward, yet the 'A' and 'D' commands appear to be much less sophisticated than they actually are. The 'A' command allows the construction of a symbol table, as well as a full-blown assembler complete with pseudo-ops and all the standard 6809 mnemonics. The 'D' command will likewise disassemble, with as little error as possible, any portion of memory. The symbols can be placed and defined anywhere in memory, and can also be loaded in from the disk drive.

The manual is very well-written and each command is covered quite sufficiently. The last five pages also include a sample session, in which the source code is included on the program disk. The sample session takes the user through almost every command and does it quite effectively. In fact, the only problem I could find with the entire package was a slight discrepancy in the addresses — the addresses listed in the manual are not necessarily the ones that will appear when the user uses the program, because the loading address will probably be different than the sample's loading address. Although nothing is wrong with this, I feel it should be pointed out in the manual so the user can adjust accordingly.

SOLVE is top-notch, and the Color Computer would do well to have programs of equal quality and design. I would recommend this program to anyone who wants a well-designed, integrated development system for the OS-9 environment.

(Dugger's Growing Systems, P.O. Box 305, Solano Beach, CA 92075, $99.95 plus $3 S/H. Supplied on OS-9 disk)

— Eric W. Oberle

Arcade-Like Performance Makes *Ms. Maze* A Winner

Ms. Maze is the Tom Mix version of the well-known arcade game, *Ms. PacMan,* for the Color Computer. According to the current Tom Mix ad, "Anything that could be done to make the Color Computer look and play like the arcade version has been done." The graphics certainly reflect this — they are sharp, with good color and movement. Played with a Kraft joystick, the game has a nice, crisp feel to it. With the Radio Shack joystick, play is somewhat sloppier but not unduly so.

The "look" of this game is very similar to the arcade version. There are four screens, each with a different maze. The first two boards must each be cleared twice, and offer side passages that allow Ms. Maze to "wrap around" to the opposite side of the maze for purposes of escape. The third and fourth boards (cleared once each) have no side passages. The fourth board is actually the same as the third, but the walls are invisible. The dots give you an outline to follow, but as these are eaten your outline disappears, making things downright exasperating. Additional points are given for eating the monsters that pursue Ms. Maze with such tenacity. These are vulnerable only when Ms. Maze eats one of the four flashing power dots, and then only for a short time.

Four options are offered at the beginning of play: BREAK, which gives a demonstration of the four boards; 'X', which gives a silly, speeded-up version of the game; 'P', which allows a practice game with 10 tokens instead of the usual four; and any other key, which starts the regular game.

Music plays a part in this game, signaling either death of one of your tokens or advancement to the next level. The tunes are well-done, but like any tune heard over and over, they soon pall. Of course, the TV volume can be turned down or off, but this does not eliminate the delay while the tune plays; this delay only seems longer with the sound off and can be annoying. A desirable option on games like this would be a "music on-music off" toggle that would also eliminate the delay caused by the tune playing. This is the only drawback to an otherwise excellent game.

(Tom Mix Software, 4285 Bradford N.E., Grand Rapids, MI 49506, cassette $24.95, disk $27.95)

— Mark Williams

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The Peeper Monitors Machine Language Program Operations

"*The Peeper* is an interrupt-based program tracer that lets you monitor operation of a machine language program while it is running." In other words, *The Peeper* runs at the same time as another machine language program. "*The Peeper* is designed to let you inspect any desired portion of the Color Computer's memory, even while BASIC or machine language programs are running. With *The Peeper*, you can display any part of memory, using any of the Color Computer's 26 documented display modes (test, graphics, or semigraphics). You can freeze the action at any time, or slow it down by practically any desired amount."

"*The Peeper* is capable of providing a running trace of the 6809's registers and stack, and supports single-stepping, breakpoints, and other useful program-monitoring functions." But *The Peeper* also caters to the non-machine language programmer. By looking "behind the scenes" at what BASIC is doing, you can get a better understanding of how BASIC winds its way through the computer and how various *POKE*s can change things. Also, *The Peeper* can be used to just watch machine language games running in the computer; seeing how the programs draw things on the screen, how some use hidden screens, etc., all by using *The Peeper* to control how the game is running.

To use and appreciate *The Peeper* to its fullest extent, I recommend some knowledge of machine language and the hexadecimal system, as the program is geared towards this. To get an idea of how powerful and extensive *The Peeper* is, here is a brief summary of *The Peeper*'s commands.

Display Mode commands — change the display to the next mode in a cycle of 13 display modes and the two color sets.

Display Window commands — control what portion of memory is displayed on the screen. They allow you to scroll up and down through memory, go back to page zero, go back to the text screen and text mode, and go back and forth between *The Peeper*'s status display page and the current display page you are looking at.

Speed commands — allow you to freeze the execution of the program being monitored, select a slow motion speed mode from one of seven (of which all can be altered, giving a very broad range of speed controls), and select slow motion speed after a 1/60 second delay so the ENTER key can be processed by BASIC.

Breakpoint command — allows the entry of up to three breakpoints. (Used by machine language programmers to halt the execution of a program at a specific address in memory.)

Trace commands — allow the trace of the program by either the address or the registers. You can display the register values and the current address being executed.

Examine Mode commands — can display any address' contents and change its value.

Other commands allow you to enable or disable output to the printer, exit *The Peeper*, and define your own "custom" functions. *The Peeper* is easy to load and comes on a cassette which can be transferred to disk. It will run in any system 16K or higher; it does not require Extended BASIC and will run with both versions of Disk BASIC. The cassette also includes two companion programs: "The first, *Rompeep,* supplements *Peeper* in that it allows you to inspect the contents of the BASIC ROMs and of ROM pack cartridges. The second program, *Find,* is a utility to aid in locating interrupt-disabling instructions that must be removed from some machine language programs in order to achieve *The Peeper* compatibility."

The manual supplied with *The Peeper* is one of the best I have seen so far for a utility program. It is long and detailed and describes every aspect of the program. It includes instructions for 64K operation and user modification as well. Also included with my review copy was a source code listing which can be purchased with the program for a couple of extra dollars — well worth it.

One part of the manual I enjoyed was the section on using *The Peeper* with commercially available machine language games. It goes into great detail on interrupts and interrupt servicing routines, and explains how to make *The Peeper* work with quite a list of games from all companies. The ones not included are left up to the user to see if they will work with *The Peeper*, but after a thorough reading and understanding of the manual for *The Peeper*, one should be able to append the list of games provided by *The Peeper*.

If nothing else, the manual is an excellent learning and teaching tool for many aspects of the Color Computer and the 6809 processor. It answered a few questions I had come across while disassembling various programs and should become a highly used publication in your library.

For the price, buy it! Order the version with the source code because even if you're not a machine language programmer yet, you will be some day, and hopefully *The Peeper* will bring that day a little closer.

(Spectrosystems, 11111 N. Kendall Drive, Suite A108, Miami, FL 33176, $21.95, $24.95 with source, plus $2 S/H)

— Eldon Doucet

One-Liner Contest Winner . . .

Pinwheel draws random circle segments; diameters, angles and colors are all random and everchanging.

Kenneth Budnark
Oakville, Ontario, Canada

The listing:

```
1 PMODE4,1:SCREEN1,1:PMODE3,1:S=
RND(100)/100:E=RND(100)/100:R=RN
D(130):C=RND(4):PLAY"V15;T255O5C
O4BAG":CIRCLE(128,96),R,C,1,S,E:
GOTO1
```

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Simulations* and its companion *Rainbow Simulations Tape.*)

Big Bird's Special Delivery Is Excellent For Teaching Classification Concepts

Big Bird's Special Delivery is another in the series of programs that are presented by Radio Shack and the Children's Computer Workshop. It is an instructional program in a game setting that provides practice in classification. Attributes are examined and compared in regard to form, class and function. The 3 through 6-year-old is the intended user. It must be stressed that these are family oriented games. For best results, an adult should be present to supervise the activities on the computer.

A small loader program is first loaded into the computer. (A Color Computer with Extended Color BASIC is needed to use the program.) After running the loader program, the title screen and opening credits are displayed. The time to load this information is long, so it is a good idea to do this before the session with the child.

There are two games on the opening menu. The first game is called the "Same Game." The child must pick the pictures that exactly match. Four pictures are displayed in the upper portion of the screen. The object to be delivered appears and the child uses the arrow keys to help Little Bird move the picture to the store that contains the same picture in the window. The up-arrow is then pressed and the picture is delivered to the store. Little Bird does a little dance of joy to let you know the goal has been achieved. If the delivery is not correct, the shopkeeper shakes his/her head and the child receives another chance to make the right delivery. The person supervising the child may need to help the child identify and name the pictures in the store windows. The graphics are as good as they could make them, but some of them are confusing. After Little Bird does his thing, the child is ready to help make another delivery.

The second game contained in the program is called "Find the Right Kind." In this segment, the child must find the object that is of similar kind. For instance, an apple appears for Little Bird to deliver. The four pictures in the upper portion of the screen are a leaf, an umbrella, a banana and a car. The apple must go to the store with the banana because they are both fruits. The same procedures are followed as in the first game and Little Bird does his dance.

The program uses nine categories for the pictures that are displayed. There are 63 pictures available for selection by the computer. The categories are clothes, ways to travel, buildings, sports, food, instruments, plants, kitchen things and animals. As mentioned earlier, the pictures may be difficult for the child to identify so assistance may be needed.

Big Bird's Special Delivery is an excellent tool for teaching concepts of classification. I found the younger children, aged 3 and 4, enjoyed the program more than the 5- and 6-year-olds. Program quality follows the same high standards of the other programs in this series. A 12-page parent's manual is included for program operation. Additional ideas are presented for follow-up activities for family enjoyment.

(Radio Shack stores nationwide, Cat. No. 26-2525, requires 16K ECB, $19.95)

—Rick Cobello

Reye syndrome is a ***rare but dangerous*** condition that can develop from ***flu or chicken pox.*** It occurs mainly in ***children under 16,*** usually when they ***appear to be recovering.*** Watch for these signs:

- ***Persistent vomiting***
- ***Fatigue***
- ***Confusion and belligerence.***

If your child displays any of these symptoms, ***consult a doctor immediately.***

Some studies indicate that there may be an association between the use of ***aspirin*** for flu and chicken pox and the development of Reye syndrome. Further studies are being conducted on this possibility. In the meantime, the ***U.S. Surgeon General*** suggests that you check with your doctor before using aspirin or any medication when your child has flu or chicken pox.

—A message from the Food and Drug Administration.

REYE SYNDROME

One-Liner Contest Winner . . .

The object here is to make a single line without crossing your path, using the joystick to change directions.

Tom Smallwood
Sierra Vista, AZ

The listing:

```
1 CLS:PMODE4,1:PCLS:SCREEN1,1:LI
NE(0,0)-(255,191),PSET,B:X=127:Y
=97:FORZ=0TO99999:IFPPOINT(X,Y)=
5THENPRINT"SCORE:"Z:ENDELSEPSET(
X,Y):X=X+INT(JOYSTK(0)/31)-1:Y=Y
+INT(JOYSTK(1)/31)-1:NEXT
```

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Simulations* and its companion *Rainbow Simulations Tape.*)

Kickoff On Your CoCo With *Big B Pro Quarterback*

My football playing era ended in high school when I spit out my four front teeth after an unexpected encounter of the painful kind with a face guard from a member of an opposing team.

Although my physical involvement with the pigskin has ended, my interest in the game has not. To the consternation of my wife, too many weekends are spent in front of the tube rooting my favorite team on the gridiron.

When there is no game on TV, to relieve my anxiety, I have even resorted to a quick game with a Mattel hand-held football game. I will admit that moving a blip on a 1-inch by 3-inch screen on a hand-held toy, avoiding the game's opposing blips is not a whole lot like the game of football.

With my current addiction to football, I was elated to hear that I was assigned the football Simulation *Big B Pro Quarterback* for review. The only involvement my CoCo had with football, so far, was using it to run the *Pigskin Predictions* program to generate a computerized point-spread prediction. I had visions of plotting end-runs around electronic blockers skillfully piloted by my CoCo.

Upon arrival, I anxiously shoved the cassette in and loaded the program. A menu appeared on the screen giving the options available. It may be played with two players or one against the computer.

When playing, you first choose a name for your team. If you are playing against the computer, you are asked to enter how fast you wish the computer to flash the plays it selects on the screen.

When the game begins, a coin flip determines which team receives the kick. The kicking team must decide whether to kick away or onside. If the ball is kicked into the end zone, the receiving team will automatically return the ball.

After the kickoff, a screen will appear showing where the ball is, the down, yards-to-go and plays left in the quarter. A game is composed of four quarters of 50 plays per quarter.

The plays available for the offensive team are:

Running plays
  -Handoff
  -Draw Play
  -Dive (over the top)
Passing plays
  -Screen Pass
  -Short Pass
  -Medium Pass
  -Long Bomb
Other plays
  -Punt
  -Field Goal

The instruction sheet suggests that you try a little experimentation to get an idea of the average yardage, completion rate, etc.

Another option available is "Scoreboard," which gives rushing, passing and total yardage statistics. Also available is a "Save Game" option which will *SAVE* a game in process so it may be finished at a later date. (I know many coaches who would like to have that option in real life.)

Upon scoring on the Extended BASIC version, the screen flashes TOUCHDOWN and sounds a little victory charge tune.

The description of the game sounds exciting; actually while playing it, boredom set in quite rapidly. This is due to many things. Primarily, there is no playing field shown on the screen. The status is shown using words on the screen rather than showing your players on the gridiron.

While your play is occurring, the screen tells you what is happening. Gains and losses are determined by seemingly preset random variables. You have no control over the success or failure of a play except choosing an appropriate play for the situation. Yardage gains and turnovers are representative of actual football situations, but you also have no control during the play.

Conversely, when you are on the defensive side, there is no active defense. The computer randomly determines whether the opposing team gains or not. In real football, offensive and defensive strategies are combined to win the game.

Overall, I found *Big B Pro Quarterback* to be a poor Simulation of the strategies involved in football, which is just as well, for with the NFL Sunday games, the Saturday college games, Monday Night Football and the USFL second season, my wife's reaction to more football time in front of a screen would cause me to wear a helmet and pads in the house.

(Big B Software, P.O. Box 91, Broomfield, CO 80020, 16K ECB or non-Extended BASIC, cassette $16.95)

— Bruce Rothermel

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64K Spooler Can Be Used With Printer Related Projects

The year is 1985 and the Color Computer has been on the market for how many years? I think it was 1980 when I brought my machine home for $399. Yet here is a piece of software with little explanation as to what it is supposed to do and how and with what you can use it! I've seen some excellent documentation and software for the Color Computer in recent months and I know that this computer can compare well with the others. Perhaps DSL Computer Products should be looking at how far documentation has advanced for the CoCo and take some lessons!

64K Spooler, from DSL, comes on a cassette with a folded card on which a brief explanation is written of how to load it and what to expect. It requires a 64K Color Computer and claims it will save the user "hours of frustration." "When you print to the printer" reads the documentation, "you'll return to BASIC almost immediately." The documentation tells you to clear some memory and type *EXEC*. It does not tell you to *CLOAD* or *CLOADM*, but since you have to *EXEC* the user must assume to *CLOADM*. This is only one example of the kind of explanation you can expect from *64K Spooler*.

So what does a "spooler" do and how well does *64K Spooler* do it? My understanding of a spooler is that it allows the user to return to normal keyboard functions while the computer takes care of feeding a printer with material to be printed. Thus a spooler's usefulness will be based around printer-based software such as word processors and other printer related projects. The problem with *64K Spooler* is that most of the software in this category already uses the full 64K memory (such as *Telewriter-64*) and won't work with it. The documentation for *64K Spooler* mentions no optional software to use with the program so the user is left to his/her experimentation. The only popular word processor that uses only 32K of memory I can think of is Color Disk *Scripsit* from Radio Shack. I would assume this is the word processor of choice for *64K Spooler*.

Since I don't use Color Disk *Scripsit*, I decided to test *64K Spooler* on a mailing list program written in BASIC I often use for our local users group. I use a printer with a large buffer so waiting for the printer to absorb a large amount of data does not depend upon printhead speed. Without *64K Spooler* it took my computer 45 seconds to dump to the printer and return to keyboard operations. With *64K Spooler* my computer returned to keyboard input in 30 seconds, a savings of 15 seconds. Sorry, but I don't consider saving 15 seconds of computer time compared with two or three minutes of loading time and $9.95 a very good deal.

Perhaps I gave *64K Spooler* an unfair test. Perhaps if I spent two or three weeks reading between the lines of the *64K Spooler* documentation I would discover the optimum usefulness of this program. But this is 1985 and documentation for computer programs has advanced past this point. The explanation of this program is the major problem in this software. Until DSL can advance its documentation I cannot recommend *64K Spooler*.

(DSL Computer Products, Inc., 4950 Schaefer, Dearborn, MI 48121, requires 64K memory, cassette $9.95)

— Brian James

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One-Liner Contest Winner . . .

This shows how you can scale what you draw in a *DRAW* command string. It draws a number of airplanes; they are all alike, but some are large and some are small.

Bryan Copeland
Keithville, LA

The listing:

```
1 PMODE4,1:PCLS:SCREEN1,1:FORT=8
TO170STEP15:L$="S"+STR$(RND(5)+1
)+"BM"+STR$(RND(170)+10)+","+STR
$(T)+"R9U3R6D6G3L15D1F2G2H2E2U1L
3H3D3U6D3E3D3R8L8U3R8U3L8R2D2":D
RAW L$:NEXT T:FORP=1TO900000:FOR
O=1TO900000:NEXTO:NEXTP
```

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Simulations* and its companion *Rainbow Simulations Tape*.)

Graphicom Joystick Solves A Problem

Cheshire Cat's *Graphicom* is a very versatile graphics package, but its "user interface" (a popular buzzword meaning the way in which you operate the program) is very strange. The worst thing about it has been the two joystick buttons. *Graphicom* uses the right joystick for drawing and moving cursors, but it also uses the button on the left stick to switch between menu and drawing modes, and you have to hold it down to stay in menu mode. I've ended up holding the left stick in my left hand with index finger on button, the right joystick similarly in my right hand, and working the stick with my right thumb!

One solution to the problem has been to wire a foot switch to the left joystick socket, but this is still awkward. Spectrum Projects has now come up with a new joystick especially for *Graphicom*, and it looks like the ideal solution to the problem.

The Graphicom Joystick is a lot like some of the CoCo joysticks that have come out in that it's based on one of those little joystick mechanisms you might see advertised in the electronics magazines. It's a good mechanism, roughly the same as Radio Shack's two-for-$30 joysticks, but the few really fussy people who can't use anything less than a Deluxe Joystick or a Hayes Mach II won't like it. (I didn't have any trouble with it myself.) The fire button is large, round and very much like the buttons on arcade machines. This acts as the pen button in *Graphicom*.

Now for the real trick. This housing also has an on-off push button wired as the left joystick button; this lets you toggle between drawing mode and menu mode without having to hold anything down. The cord has two plugs coming out at one end; the one with the thicker cable (more wires inside) going in is the right plug.

This little blue box, with the menu switch, pen button and stick neatly arranged from left to right, gives you full control of *Graphicom* in one unit. It also can be used as a single joystick, or you could even write programs that use both buttons. Spectrum's Graphicom Joystick really improves a popular program.

(Spectrum Projects Inc., Box 21272, Woodhaven, NY 11421; Box 9866, San Jose, CA 95157-0866, $24.95 plus $3 S/H)

— Ed Ellers

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Software Review

VIP Calc: Spreadsheet For The Color Computer

By Stuart Hawkinson

VIP Calc, a professional spreadsheet program for the Color Computer, offers more usable features than most existing CoCo spreadsheets. *VIP Calc* works almost identically to *VisiCalc*, the original spreadsheet program, so you can use the many books and articles on *VisiCalc* to learn about spreadsheets. In addition, *VIP Calc* adds mini-operating system commands to allow disk and tape operation from within the program. This provides the same display, formatting, and disk/tape operations provided in the other *VIP* family programs.

VIP Calc operates on both 32K and 64K CoCos, with separate versions for each in the package I reviewed. The 64K version gives you over 32K memory (with some options removed), a large amount of user area for your spreadsheet calculations.

Several options are available for tailoring the display to your taste. A high-resolution display allows you the choice of 51, 64 or 85 characters per line. In addition, the normal 32 character low-resolution display is available and gives an extra 6K of user memory. You can also select either 21 or 24 lines instead of the normal 16 lines per screen. Combined with options for narrow or wide characters, green or buff background, and inverted images, you have practically unlimited display choices.

Command modes are clear and easy to use. The main program operates with multilevel, single-key command sequences. Most have help facilities to explain your choices at each level. You reach the special command mode by pressing the CLEAR key twice. In the command mode, you have access to the disk/tape commands and the many formatting and display options.

VIP Calc has a full complement of formatting features for printed output. Included are such options as header and footer lines, line spacing, margins, page numbering, and printer Baud rate and word length settings. Single sheet printing pauses and special pauses to change type wheels are supported. You can embed printer codes in the label fields to get special printer effects such as emphasized or compressed text. The formatted text can be saved to an ASCII file for use by other programs such as a word processor. With this feature, you can incorporate parts of your spreadsheet data into another report.

Program Details

VIP Calc is professionally produced and packaged. The program is supplied on either disk or tape. It comes with documentation in an attractive folio case. The loose-leaf manual is over 175 pages long and typeset with proportionally spaced font. The manual starts with a five lesson tutorial. This provides an introduction to the many features of *VIP Calc*.

The manual contains a complete description of the available commands and options. Summary appendices give a quick reference to the commands and formatting options. Several books are suggested for further study by those not familiar with spreadsheets.

The edition of *VIP Calc* which I reviewed was supplied with both 32K and 64K versions. The 32K version did not support all of the special functions (such as SORT, EDIT and LOCATE), or Hi-Res display. The 32K version will operate on a 64K computer, however, giving a larger user memory. Recent ads for *VIP Calc* indicate the 32K version now supports the SORT and EDIT functions, and Hi-Res displays. The 32K version I reviewed also omitted the the trigonometric function.

VIP Calc not only has a full complement of standard spreadsheet functions, but also has some unique features. As with most spreadsheets, you move from cell to cell using the arrow keys. With *VIP Calc*, various combinations of SHIFT and CLEAR with the arrow keys allow you to move over the entire spreadsheet. You can scroll to the start or end of a page, as well as to the start or end of the defined area of the matrix. The *GOTO* command (>) sends you to a named cell (as explained in a help screen).

VIP Calc simplifies editing your worksheet with two functions. The LOCATE command allows you to search for strings in labels or for values similar to a word processing program. The EDIT command makes changing complicated formulas easier than retyping the whole expression.

The SORT function is a welcome addition to a spreadsheet, available only as an expensive add-on for the original *VisiCalc*. The SORT function allows you to sort numeric or alphabetic data by rows or columns, in ascending or descending order.

A unique feature of *VIP Calc* executes programmable functions. By recording keystrokes in an unused cell, you can execute them with the *CLEAR-X* command. This form of macro facility is similar to those in second generation integrated spreadsheets such as *Lotus 1-2-3*. You can even embed programmable functions in other functions. Since

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the command mode and mini-operating system are available to the programmable functions, you can do an amazing amount of work.

Three macro examples are described in the manual: printing a number of copies of your spreadsheet; customizing complex formulas to save keystrokes; and saving two copies of your work, printing a copy, and clearing the work space to be ready for a new problem. The ability to execute these macros opens up new vistas to the programmer.

In addition to the well-written documentation and help screens, *VIP Calc* has several other friendly features. You can select the number of significant digits to display, and do calculations in single or double precision (16-digit accuracy).

You can also use a simple calculator from the command line (with +-/* and power as operations). This allows easy access to a calculator for data entry. I recently saw a $39.95 option for an IBM PC spreadsheet to give it the same capability. You also have the option of selecting the base (2, 8, 10, 16) of the calculation.

Problems Encountered

I had problems with several of the *VIP Calc* functions. I found a bug in the LOCATE command. If you search for the string ABC and have entries such as XYZABC and XYZAABC, the program will find the first occurrence of ABC but not the second. The double letter combination causes a problem. Apparently the search algorithm resets pointers incorrectly after a partial match.

Several of the trig and log/exponential functions have bugs as well. The ATAN function doesn't give any reasonable answers. The LOG(X) function is incorrect for X=0.5, while EXP(X) is wrong for ABS(X)<0.25. Also, if you post-multiply a function, such as SIN(0.25)*2, you get the function with the argument multiplied instead, as SIN(0.25*2).

A fatal error occurs when you try to abort a replicate command. Normally, you can stop any command by pressing the BREAK key. This is handy when you make a mistake, however, when you are using the replicate command, and you get to the question "Replicate: Relative y/n?," if you hit the BREAK key the system hangs up. I lost an entire spreadsheet to this bug.

Overall Impressions

VIP Calc offers a good value in a spreadsheet for the Color Computer, as it closely follows the *VisiCalc* model. You can use almost any text or article on *VisiCalc* or *SuperCalc* for sample spreadsheet templates. *VIP Calc* will appeal especially to those already familiar with the command structure of *VIP Writer*.

VIP Calc gives you a large user space in a 64K CoCo. Its many display and formatting options will benefit most users. Hopefully, the bugs and limitations of the review copy have been corrected in the current release.

(VIP Technologies, formerly Softlaw Corp., 132 Aero Camino, Goleta, CA 93117, tape or disk, $59.95 plus $3 S/H)

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Avoid Crashing With Multifaceted *Auto Run 64*

Auto Run 64 is a multifaceted utility program that "generates a machine language loader program that precedes your program." This program has been around for some time, and now Sugar Software has updated it to function with the new 64K CoCo memory. The new addition includes a reset routine to prevent program crashing, relocating ROMs in the 64K CoCo to give you an added 8K of memory usage, and the ability to create loader programs for 64K CoCos on 32K or smaller memory CoCos.

When the program is loaded, it displays a title screen, then a prerecorded "car crash" (this is an audio sound recording, not computer sound), and then the program menu screen is presented for you to continue.

This utility program is a marriage of BASIC and machine language. The user can interrupt the program and see the BASIC listing, and Sugar Software has provided a source code listing of the machine language part. (Sugar Software does not provide the 64K machine language source code due to a proprietary algorithm.)

The program is recorded on both sides of the tape and the many times I loaded it, I experienced no problems. The main menu lets you select "Create title screen" or a "Program tape" (with *Auto Run*) or "Return to BASIC." (Note: the created or loaded title screen remains in memory until cleared, overwritten, etc.)

The instructions booklet with the tape is well-written and very comprehensive. All the menus and control keys are fully explained. The title screen menu lets you Initialize, Load, Edit and Save the title screen you created or loaded (for edit). You can create and save as many title screens as you want, then select the one for your *Auto Run* program. The *Auto Run* graphics editor lets you create a low resolution title screen with text and graphics. You can select one of eight color borders, or select one of six different border styles.

Using the same arrow keys used to position graphics, you also position the text. Incorrect keys result in an audio beep response; you must respond with an acceptable key code.

Once the title screen is created, you can either save it or proceed to create an *Auto Run* program tape. Selecting from the menu, you can add to your *Auto Run* program a custom sound/audio selection. The program's menu and instructions will guide you all the way.

In the sequence of instructions the program asks if a machine language program or BASIC program is going to be used, and the booklet instructions tell you (when you are in the Define Parameter mode) where in memory your BASIC program (can) will reside. The Parameter mode also lets you select the time for the audio portion of your auto-load program. There is also a provision to test your audio selection before you use it. It is interesting to note that the auto loader program actually consumes no memory from your program.

While you can use this utility as freely as you want on your own private programs, they do require that if you want to use the program in a commercial venture you need only follow the instruction they give, and send them a copy of the software that uses the *Auto Run 64* program.

Lastly, because the largest part of this program is a well-organized BASIC program and can be viewed by the user, one can learn a lot about this fast response graphics program. Those that have a disassembler can also look at the machine language part of the program.

This program is a highly recommended utility for those who want their programs to run *Auto Run* style, privately or commercially. An added bonus, as mentioned above, is the machine language graphics screen saving program built into the utility program.

(Sugar Software, 2153 Lean Lane, Reynoldsburg, OH 43068, 16K ECB required, $24.95 plus $1 S/H)

—Stephan A. Brown

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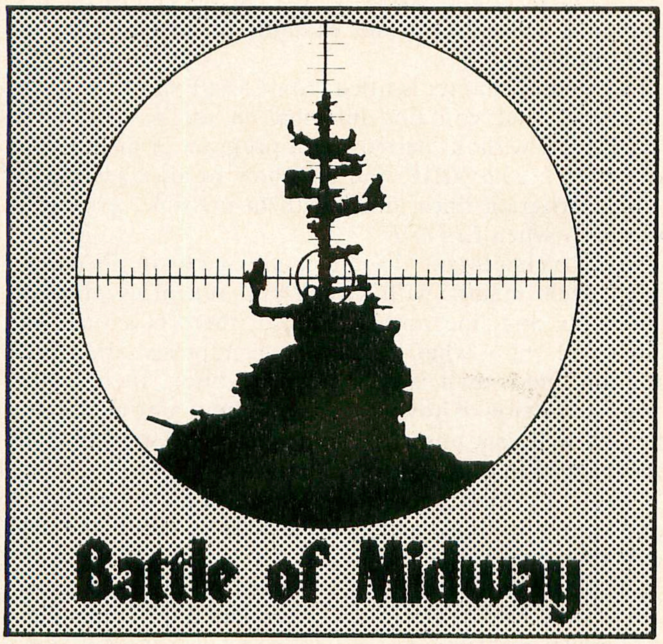

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Unleash Your CoCo With *BASIC Programming Tricks Revealed*

How to do what Radio Shack says you can't — at least this should be the title of the new book out by Creative Northwest Programming. The real title is *BASIC Programming Tricks Revealed* and is distributed by Spectrum Projects, Inc. In this book are many interesting, powerful, and just plain ol' fun tricks you can play on your CoCo to make it do many of the things it wouldn't ordinarily do.

Chapter 1 contains detailed information about the direct page and variable storage locations. In it are listed many useful addresses and short descriptions of what they are used for. For instance, one two-byte location contains the address of the start of a data line, and another contains the line number of the current data line (both of which are used later in the book to allow a partial restore of data beginning at a specified line number). In the list are included general addresses, Extended BASIC addresses, Disk BASIC addresses and RAM vectors. At the end of the first chapter is a discussion and example of how to alter the RAM vectors.

The second chapter is titled "Start and End of the BASIC Program," and contains information on how to do a *PCLEAR 0* without destroying a program in memory, as does *POKE 25,6:NEW,* and also how to alter a program to hide program lines, making them invisible, or appear differently when *LISTed.*

Next is a chapter on "The Structure of a BASIC Program" which deals mainly with how BASIC tokenizes program statements and line numbers. Also, there is a one-liner which will show what the tokenized representation of a program line is as it is entered. In addition, there is also a brief discussion of how to conserve memory by combining lines, as well as a numerical example of the memory that can be saved in this manner.

Chapter 4 deals with eliminating the time-consuming "garbage collecting" and gives examples using the two methods covered.

Chapter 5 discusses "Seldom Used Useful Functions" such as the *PEEK, POKE, AND, OR* and *NOT* commands, and how to use them.

Chapter 6 is "Playing With Hi-Res Graphics" and shows how to manipulate the graphics memory by implementing a *PCLS* command which allows user input of the start and end line number. Also included is a program that will allow the user to view the graphics representation of any section of memory, and a brief section on how to use variables within *DRAW* and *PLAY* command strings.

Finally, Chapter 7 is devoted to "Disk Tricks" and contains several examples of how to use the built-in *DSKCON* subroutine to check the validity of a disk and to save the directory in case of a disk crash. Also included are several other routines to make the CoCo allow 35-track access, double-sided drive use without hardware modifications and other tricks of the trade.

Chapter 8 should perhaps be an appendix instead of another chapter since it deals with "Special Things That Can Make Your Program Crash!" These include common mistakes that can take hours to find, since they are so "obviously correct."

As a summary there is a 4½-page program that uses almost all of the routines, tricks and other programming subtleties in the book in the form of a file handling program.

I found the book an excellent help in understanding how the Color Computer works and how to make it work for me. The modifications necessary to cause the computer to ignore what it was originally intended to do, and instead do what I want, are amazingly small programs and subroutines which are easily *MERGEd* with an existing program to create a powerful customized utility, game, etc. As is stated in the beginning, *BASIC Programming Tricks Revealed* contains valuable routines everyone can use, but only the moderately advanced programmer will understand. In general, it is an excellent book for *any* BASIC programmer.

(Spectrum Projects, Inc., P.O. Box 21272, Woodhaven, NY 11421, or P.O. Box 9866, San Jose, CA 95157-0866, $14.95)

— Jim Sewell

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The game requires at least a 32K computer and is compatible with either cassette or disc systems. Both versions are shipped on tape.

THE SPANISH ARMADA $24.95

Send check or money order to Picosoft Games, P.O. Box 35, Eighty Four, PA 15330; (412) 267-3721. Games are shipped postage paid. PA residents add 6% Tax. No delays for personal checks.

Improve Math Skills With *Teasers By Tobbs*

How good are you at adapting to new concepts? I've found that my kids (Mike, 7 and Bonnie, 10) are quite a bit better at it than I am. The catalyst for this discovery is a math education program from Sunburst Communications.

Having been taught my "Reading, Writing and 'Rithmetic" during the '50s and '60s, my mind was locked into vertical or horizontal positioning of addition or multiplication problems, such as:

2 x 3 = (or) 2
x3

When the digits exceed nine, I have my trusty calculator to bail me out. It's amazing how much we depend on those portable calculators now. I remember when I could add more than single digits in my head.

Teasers By Tobbs, however, faced me with a math problem which looked like this:

*	2	4
3	6	12
6	12	□

My first reaction was "huh?!" Even after reading the manual, I didn't understand the problem and the relationship of the numbers. As a last resort, I consulted a much more flexible source of knowledge regarding such things to solve this puzzle — my kids. It was no problem for them, and with a great deal of patience, I was running the program with all the skills of someone born in the '70s.

Teasers by Tobbs uses the tic-tac-toe-like grid to present a math problem so a group of numbers interact with each other to solve the problem. Using the above example:

Position reference

1	2	3
4	5	6
7	8	9

Problem

X	2	4
3	6	12
6	12	□

If you multiply 2 times 3 (position reference 2 times position 4), you get a 6 (space 5). The answer is placed where lines drawn inward towards the center of the puzzle intersect. Therefore, the blank box is solved by multiplying 4 times 6 (space 3 times space 7) which is 24.

Once you get the basic knowledge of which numbers interact with each other, it makes sense.

The puzzles get interesting and more challenging at the higher levels. There, more than one number is missing, forcing the pupil to solve more than one math problem to get the necessary information to solve the puzzle completely.

For instance, solve this:

X		
4	8	□
3		9

The answer is 12. If you can't figure out how it is so, I would suggest you let your kids help out.

The program has six levels each for addition/subtraction and multiplication/division. Help is available to the student without parental or teacher assistance by pushing the 'H' key.

The program is made more interesting by the use of a little gremlin called "Tobbs," who appears in the answer block. The screen prompts you to tell Tobbs what answer to put in the square. When the correct answer is entered, Tobbs does a little dance, prance and a flip. When the incorrect answer is entered, he shakes his head sadly and the screen asks you to try again.

The program is a challenge, and the different levels make it usable by a wide variety of age groups (including adult). If I keep giving Tobbs the correct answers, I might eventually be able to wean myself away from my calculator.

This program is released for a variety of computers including Commodore and Apple. Possibly because of this wide usage, it fails to take advantage of all the capabilities of the CoCo.

The graphics are excellent. The characters and numbers generated by this machine language program are very readable, but the program does not use any voice or sound to aid in reinforcing positive responses for the correct answers or negative responses for incorrect answers. Any program which doesn't use the sound capabilities of the Color Computer gets dull very fast and is sadly behind the times.

Other than this lack of full utilization of the sound and speech capabilities, the program is well-designed and even fun. It's expensive and requires a 32K minimum Extended BASIC disk system which limits the number of people who can use the program, but overall it's a professionally done package.

(Sunburst Communications, 39 Washington Ave., Pleasantville, NY 10570, 32K Disk ECB required, $49.95)

— Bruce Rothermel

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Burner+ Is A Great Tool For The Avid Tinkerer

An EPROM programmer is one of the more esoteric tools a hacker might use to further his craft. Using one, you could turn a patch for BASIC that has to be loaded every time you power up into one that's just as permanent as BASIC itself, or put that new machine language arcade game or utility you just wrote into a cartridge you can just plug in, switch on and use.

The EPROM programmer is only a useful tool on the CoCo, though, if you know how to write in machine language and want to do things like BASIC patches and other ROM-based programs. If you also have other computers around, there may be other things you can use an EPROM programmer for, like new display character sets and the like. Burner+ does a first-rate job performing this task.

First, a little information about ROM (read-only memory) chips. The BASIC ROMs in the CoCo, as well as those in many game and other cartridges, are "masked" type chips; the manufacturer takes the desired program and designs a mask that is used to make the actual circuits. This is fine when you need thousands of copies (in fact, it's the cheapest type of ROM), but if you only need one, a dozen or a couple hundred (or if you can't wait for masked ROMS to come back through the production cycle), you need a chip that comes blank and that you program yourself.

After a brief fling with "fusible-link" PROMs, the EPROM (erasable, programmable read-only memory) has emerged as one of the most widely used chips. EPROMs can be programmed with reasonably simple equipment, and when the contents are no longer needed, you can erase them by exposing them to a strong ultraviolet light source. (Black lights won't do; you need special UV fluorescent tubes in a shielded enclosure to avoid exposure to UV rays. Several EPROM eraser units are on the market, including one from Heathkit.)

The Burner+ is a deceptively small gadget housed in a standard cartridge case. There's a special "zero insertion force" socket on top to accept the EPROM, a set of 10 tiny switches to set up the Burner+ for a particular job, one more switch to adjust for fast and slow chips and a power input jack to supply the 24-volt source needed for programming. (The unit comes with a special adapter to connect three 9-volt "transistor radio" batteries in series; an AC adapter is available as an option.)

There's also an edge connector on a short cable to let you connect a disk controller or other cartridge along with the Burner+ without any other adapters. The unit is designed to program the very common 27xx series EPROMs (which range from the 1K 2708 to the 16K 27128); there are a number of socket adapters available that allow the use of other common EPROMs. One of these lets you use the Motorola 68764 8K EPROM, which is "pin-compatible" with the masked ROMs used in the CoCo and therefore plugs in without rewiring.

The driver software, appropriately enough, is contained in a 2K 2716 EPROM. Burning EPROMs doesn't take much in the way of software; you could even write your own driver in BASIC (though it would be rather slow). The supplied driver provides a number of useful functions, but (oddly enough) no way of loading or saving files to tape or disk; you do this yourself with the usual BASIC commands. There are commands to set EPROM size (though you still have to set up the switches), finding blank spaces in an EPROM, speed of programming (there are two speeds, one for fast chips and another for those that are relatively slow) and doing the actual transfer. Transferring data to an EPROM is pretty much the same as just moving it into high RAM, but is done with the 24-volt power supply attached. The process takes about 25 seconds (or eight minutes on a slow chip) for an 8K EPROM like one you would use to replace a BASIC ROM.

The Burner+ is not without its bugs. First of all, the EPROM addresses are at the top of memory; to program a 16K EPROM on a disk system you have to switch the disk ROM out of the way. This also means you can't program anything into the last few hundred addresses on a 16K chip, because the signals will go to the CoCo's SAM and PIA chips instead. (If you're programming a 16K EPROM to replace disk BASIC and add new features, you won't be able to use those addresses anyway for the same reason.) 16K EPROMs aren't commonly used, so this may not bother you.

The other minor bug is that you need to be careful when setting the DIP switches, as it is entirely possible to pull the whole cartridge out and damage the computer. This is easily solved by holding the Burner+ cartridge in with one hand while flipping switches with the other.

The Burner+ is not a bad item. It will program most common EPROMs easily, and if you can live with its minor quirks, it's a good value.

(Pollak Electronics, 13761 Grosvenor Rd., Surrey, British Columbia V3R 5E5, Canadian prices: Burner+ $157, AC adapter $23, socket adapter $4)

— Ed Ellers

One-Liner Contest Winner . . .

This shows a spacecraft rising slowly (and smoothly) off the launch pad, with sound effects.

Steve Schutjer
Hazel Green, WI

The listing:

```
1 PMODE4:PCLS:SCREEN1,0:X=50:DIM
Z(20,25):DRAW"BM0,177R255L95U40L
20D37L30D3R35U5R5D5U5R5D5":DRAW"
BM120,170U5E3U7E2F2D7F3D5H3D4L4U
4G3":GET(118,152)-(133,173),Z:FO
RS=173TO21STEP-1:PUT(118,S-21)-(
133,S),Z:X=X+1:SOUNDX,1:NEXTS
```

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Simulations* and its companion *Rainbow Simulations Tape*.)

Air Traffic Control Simulator Excels With Precise Features

By Larry Birkenfeld

"Pilot to tower. Pilot to tower. Bay Federal 23L requesting instructions. Hey guys, are you down there? I'm getting dizzy circling. When can I land?" Ah, the work of the air traffic controller is never done! That is how I felt when I began my review of *Air Traffic Control Simulator*, hereafter referred to as *ATC*, by Betasoft Systems.

The *ATC* game is a very realistic Simulation of life inside the control tower at your local airport. The game is written for a 32K Color Computer and may be purchased on cassette or disk. The package comes complete with a 27-page, 8½ x 11-inch, bound instruction manual and a quick reference card containing a summary of all communication instructions. For those of you, like myself, who are unfamiliar with "tower talk" there is a section in the manual on basic air traffic control principles. The instructions are simple enough for even the novice to be landing aircraft in no time. The game, however, is a real challenge.

Not being a pilot myself, I decided to enlist the assistance of a pilot friend, Paul Tudor, in order to evaluate the realism of this Simulation. After playing the game for a while, we both agreed with the claims made by Betasoft Systems that this Simulation is indeed as realistic as possible within the constraints of a 32K CoCo.

To play the game, you must be both tower controller and radar controller. As tower controller you must handle all departing aircraft as expediently as possible. As radar controller you must use your radar screen to vector (controller talk) your aircraft either into landing position or through your airspace. You must control both IFR (instrument flight rules) and VFR (visual flight rules) aircraft. These IFR and VFR craft have a different cruising speed, landing speed and rate of descent. Scoring is based on your ability to land craft, allow craft to depart, respond to craft entering your airspace, and keep an appropriate altitude and distance separation between craft. Believe me, after trying to do all this at one time, you will understand why an air traffic controller's job is so full of stress.

The display uses a high resolution screen and mixes text and graphics. The only complaint I have is that the text used as craft identifiers on the radar screen is extremely difficult to read using a standard television. I even tried three different sets, a Sharp, a Sony and a Zenith black-and-white, with no luck. Other than this one problem, the display was excellent. The Simulation provides a radar screen representing an area 40 miles in diameter. In the center is a backward 'L' representing an east, west, north, and south runway. Outside each runway is an indicator mark representing the outer limit marker five miles from the runway threshold. Around the screen are "tick" marks representing degrees, with 360 degrees being straight up.

Each corner of the screen is also used to display information. The bottom right corner shows an enlarged view of each runway and any aircraft awaiting takeoff.

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As many as five craft may await takeoff with only three being displayed at any one time. Here's true realism in every detail. These planes even make a 180 degree turn onto the runway as they depart, just like the big boys do. The bottom left corner contains the temperature, ceiling, sky, visibility, precipitation, and wind speed and direction. One important point here that can save novices hours (I know from experience), the wind direction indicates the direction the wind is coming from, not the direction it's blowing toward. If you're not sure which way to land, just watch in which direction the aircraft takeoff.

Both of the top corners contain communication information. At the left you receive messages from the aircraft and on the right is displayed the last two instructions sent out from the controller. There are also various sounds which are used as notification that a new aircraft has entered your airspace, an aircraft is requesting instructions, or one of your commands cannot be carried out due to one of five possible errors which are listed on your quick reference card. A timer is also displayed and the radar screen blinks every five seconds as its contents are updated.

As I said before, there are both IFR and VFR aircraft to deal with. Some want to land, some to take off and others simply want to pass through your area. Each type has its own specific set of communication and landing rules. For example, IFR craft must be cleared for approach outside the outer marker, but within a 60 degree cone of the runway threshold. If they are not within the cone and at an altitude such that they may descend to 1,500 feet by the time the outer marker is reached, you will hear a loud tone and receive the message "parameter out of range." Once within the outer marker they must be cleared for landing. VFR craft must be inside the outer marker and within a 30 degree cone to be cleared for landing. The same ominous sound occurs if they cannot attempt a landing. VFR craft must also be requested to "squawk" (more controller talk) before they will accept any communications from the controller at all. Paul the pilot, who flies VFR craft, informs me that this is indeed the way it is!

Communications messages are typed and appear in a scratch pad area below the weather information at the bottom of the screen. They may be edited before pressing return to send them to an aircraft. All messages consist of a three character alphanumeric craft identifier such as "23L" followed by commands and parameters. A few examples would be the following: 23L TH36A40 (23L turn to heading 360 and climb/descend to 4,000 feet) and 23L CL27 (23L cleared to land on runway 27). There is even a command to stack aircraft in a holding pattern if it gets too much for you to handle all at once.

Once you begin playing *ATC* it will become habit-forming. A word of warning is needed at this point: don't begin unless you plan to spend some time at the computer. Everything is true-to-type, including the time it takes to vector a plane into landing position. I spent two days trying to land planes. My longest single sitting was more than three hours straight. I'm glad I wasn't a passenger on any of those planes! All this is on the least difficult mode. There are two other modes, moderate and heavy, providing more air traffic in each mode. After experiencing these, I was ready to go on strike myself.

For anyone wishing to experience the thrill of an airport environment, *Air Traffic Control Simulator* is the one to buy. The realism abounds, right down to the bloodshot eyes. Other than the hard (but not impossible) to read craft identifiers, I found no noticeable software bugs. The documentation is excellent and even provides some training for a novice like myself. A lot of work went into this software to achieve such authenticity. It's a real buy!

(Betasoft Systems, P.O. Box 1174, Smithtown, NY 11787, tape $34.95, disk $37.95)

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One-Liner Contest Winner . . .

This shows the planet Saturn, with its rings, and a few other planets in the background.

Todd C. Hauschildt
Red Wing, MN

The listing:

```
1 PMODE4,1:PCLS:SCREEN1,0:FORZ=1
TO30:CIRCLE(128,100),Z:NEXTZ:FOR
Z=60TO92STEP4:CIRCLE(128,100),Z,
,.2:NEXTZ:FORZ=1TO3:CIRCLE(30,25
),Z:CIRCLE(180,160),Z:CIRCLE(230
,80),Z:NEXTZ:FORZ=1TO7:CIRCLE(50
,150),Z:NEXTZ:CIRCLE(140,30),1:F
ORZ=0TO1STEP0:NEXT
```

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Simulations* and its companion *Rainbow Simulations Tape.*)

Text Master And *Graphic Master* Transform CoCo's Screen

By J. Michael Nowicki

This review covers two programs, *Text Master* and *Graphic Master*; each can work alone or be used in conjunction with the other for some pretty impressive results.

Text Master will transform your CoCo text screen into a smart and sophisticated screen that is a pleasure to use.

Getting started is very easy by *CLOADMing* or *LOADMing* the program and *EXECuting* it. The setup takes about 15 seconds after which your screen is transformed into a smart screen with a wide variety of text sizes and special effects.

There are six sizes of character sets: 32 x 24; 36 x 24; 42 x 24; 51 x 24; 64 x 24; and 85 x 24. These can be enhanced by using a proportional mode that produces some of the most attractive and readable character sets I have seen on the CoCo. However, using this mode cancels the left-arrow cursor movement which can be a little confusing when editing program lines.

Other features include underline, inverse video, subscript, superscript, audible key click, bell ring, auto key repeat, screen inversion, screen/printer echo, regular or fine text scrolling and upside down printing. You can use any or all of these features on the screen at the same time using the same technique used to initialize a printer with BASIC's *CHR$* command. To turn on or turn off any feature takes just one *CHR$* code and by printing a *CHR$(0)*, you can turn most of them off to start up default mode. There are several useful cursor movement commands with obvious word processing application.

There are two animated cursors for the different size text characters that make it hard to lose your place on the screen. There is an auto key repeat feature, but it moves much too quickly to be of any use unless you have cat-like reflexes. There is no mention of controlling the repeat speed in the manual.

The *PRINT@* and *CLS* instructions have been patched for full compatibility in all text size modes. The *CLS* can be used to clear the video text screen as usual, or you can add a bit pattern parameter such as *CLS(102)*. The upside down printing mode will be appreciated by Spanish speaking users who need to use characters unique to that language.

Any key can be redefined and saved to tape or disk, and you have the ability to switch back and forth between regular keyboard definitions and custom characters stored in memory. A character editor is included that allows you to redefine the character set shapes and their ASCII equivalent codes. A person could easily redefine the keyboard for foreign scripts such as Arabic, Japanese, Cambodian or Cyrillic which use special alphabet symbols, and turn CoCo into an international word processor of your own design.

Text Master is meant to be used with your own BASIC programs; no mention is made in the manual about using it with canned software or the user's machine language programs. I have found, however, that any machine language program that uses the official Radio Shack indexed addresses of $A000 for keyboard input and $A002 for screen/device output, and has no memory conflicts, can be adapted. Even copy protected text oriented programs using these ROM calls seem to work just fine.

The documentation comes in a silver three-ring binder just the right size to fit on top of CoCo without mousetrapping closed. A BASIC demo program is also included to show you what can be done, and the user is encouraged to study its listing. The manual itself is very much like a printer manual, giving you the *CHR$* control codes and general notes about the program. A chart of special purpose memory addresses for use by machine language programmers is included, as well as a reference card with all the *CHR$* code meanings. The character editor program is simple and easy to learn, and it can load or save keyboard definition to tape or disk.

Text Master requires 64K tape or disk and was tested using all ROM versions with no problems. The program is not copy protected and comes supplied on a tape with simple instructions for disk transfer. It takes up a little over 8K, resides in high memory above the disk ROM space, and uses a *PMODE 4* screen starting at the cold start default location. No instructions are given for changing the screen memory start address, but if you poke the new address into low housekeeping RAM that contains the screen addresses, you can move your graphics screen

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anywhere in low RAM before *EXECuting* the program.

BASIC and Extended BASIC commands work just fine with *Text Master*, so you can combine text and graphics with good effect. The text screen displays black text on a green background. There seems to be no provision to use the black/buff color set without doing some modification to the $FF22 address contents that control *PMODE 4* color sets.

One of my favorite acid tests of a graphics text generator is what it does when you try to format a disk using *DSKINI*. Many other programs of this type I have seen either belly up and crash, or revert to the 32 x 16 text screen and you have to *reEXEC* to program afterwards. *Text Master* will format a disk, but it takes about twice as long to do the verify pass. The display will garbage up during the format process and return to normal operation once the disk is formatted.

One of the first things I did with *Text Master* was convert a drab Disk BASIC program I wrote to keep track of my video library. In less than an hour I had reincarnated the program into a very attractive format that flashed the searched-for data on the screen with reverse video and bell sounds. The program also uses a printer and direct access disk commands that can sometimes gum up a poorly designed text generator, but this one did it with no I/O problems.

One of my main uses for CoCo is as a smart terminal for decoding of radioteletype news services, embassy transmissions, and weather stations from around the world using a high frequency communications receiver and a military surplus radio modem. You lock onto a signal and text scrolls across your screen like an electronic newspaper in English, and sometimes, Spanish. However, many signals to and from Eastern European Warsaw Pact countries are being sent in the Cyrillic alphabet, with its own weird and unique third register character set. I was able to develop a Cyrillic character set with the *Text Master* editor, change the recognition codes and patch it into a commercial machine language RTTY program; these transmissions that I previously thought were unreadable were made clear. This is, I admit, a rather esoteric application, but it does serve to illustrate the versatility of this program and what it can do.

All character sets are generated in *PMODE 4* and you are locked into this Hi-Res mode. Some of you may comment that in *PMODE 4* there are two color sets of two colors each, and what good is a Color Computer without multicolor graphics? This is where the other program, *Graphic Master*, comes into play. In essence, this program lets you design and implement multicolor *PMODE 4* artifact graphics through BASIC that execute with the speed of machine language.

The graphics commands found in BASIC and Extended BASIC are easy to use and powerful, but very slow when large areas are to be painted or animated. This program is a new graphics operating system that does not use the BASIC graphics commands unless you want to include them in addition to using this program's commands.

All the new graphics commands are called by using a USR call with parameters tagged onto it. It dedicates the USR0 call for graphics use, but you can still employ the other nine USR calls for your own use.

Many commands are like their Extended BASIC cousins to reserve memory for graphics screens, flip pages, clear screen, draw lines, paint areas, set points and *GET/PUT*. The difference is the speed. Using Extended BASIC's command to paint an entire *PMODE 4* Hi-Res screen would do it in about 15 seconds. The DYE command used in *Graphic Master* does it in the blink of an eye. Not only can you dye in colors, but with bit patterns as well.

The *GET/PUT* equivalent commands work very fast, regardless of the size of the sprite being moved around the screen, with little or no flicker or jerkiness. The SCROLL command lets you move an entire Hi-Res screen like a curtain, similar to arcade games that scroll game screens.

My favorite command is POLYGON, which allows you to define a geometric shape with up to 255 sides and move it, rotate it and change the size with the speed of machine language. Quite impressive!

The demo program included with this software package really sets the hook in anyone who sees it, especially when you tell them its all done through BASIC commands. It really demonstrates the graphics potential of the CoCo using high speed *PMODE 4* artifact colors. Images are created with *DATA* statement tables, and stored in memory as a machine code image table. It's the missing link between pure BASIC and pure ML programming, using the best features of both.

Machine language programmers can doodle with arcade game designs through BASIC using the same data images tables as they would programming in assembly language, and if the idea works out, the transition to 100 percent ML is very easy.

All that is required of the user is to have a decent working knowledge of variable housekeeping using BASIC, and a

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conceptual understanding of using screen coordinates to direct movement. The program does all the rest for you. Anyone with these fundamental skills can write an arcade game or graphics-oriented program with professional results.

Even more amazing is that the minimum system required is only 16K BASIC with tape. A special *CLOADM/ CSAVEM* command has been thoughtfully included for those without Extended BASIC. Program overhead is a little over 2K, so with 16K you can't use all the features, but with 32K or 64K you can do some pretty amazing stuff that you may never have seen done on a CoCo before. A utility program is included to do three-dimensional rotation of complex shapes that gobble up a lot of memory, but produce results similar to drafting programs used in high-end machines.

All is not roses, however. The user's manual is nothing short of user-hostile, and is a classic example of why the programmer should not write the documentation other than to supply technical information to the writer. The reason I suspect the programmer wrote the manual is because too much is assumed without starting at base one, and the page numbers start with Page 0! Only programmers number that way.

Misspellings occur throughout the manual, the most disconcerting being "softwhere" on Page 2. There is no table of contents or index, so you have to page through the manual to find what you're looking for. Two pages contain a summary sheet of commands and syntax for reference. Very serious errors occur, such as on Page 17 where the QLINE2 command is explained. It should be defined as USR(13), but it is mislabeled as USR(11). The program comes on tape with instructions on Page 52 to transfer the programs to disk. One of the line numbers referenced for changing *CLOADM* to *LOADM* is incorrect and so is the replacement line. You have to add a couple other program lines to input a disk filename, but the manual doesn't tell you this. With *CLOADM* you do not have to specify a filename, but with *LOADM* you do.

The manual does not take you by the hand like the manual that came with your CoCo; you will have to put in many unnecessary extra hours learning to use this outstanding program that could have been avoided by good documentation.

Graphic Master comes with a graphics editor to design graphics figures, but when I tried to run it I got an OM? Error. An inquiry to Dataman concerning this bug brought no response whatsoever. After about an hour of analyzing the program I found the bug and fixed it — another hour down the drain.

Both *Text Master* and *Graphic Master* are useful, well done programs and worth the price. What you can achieve with them is directly proportional to your level of programming skill and imagination.

In summary, *Text Master* is an excellent screen text enhancement program with adequate documentation. The price is right and I would highly recommend it. *Graphic Master* is an absolute gem of a graphics development program that is severely crippled by documentation that has to be corrected, if not completely rewritten for clarity.

(Dataman, 420 Ferguson Ave. N, Hamilton, Ontario, L8L 4Y9, *Text Master*, $29.95; *Graphic Master*, $49.95)

Accessory Review

Clean CoCo's Disk Drives With Floppiclene

As one might have expected, since disk drives have become common items a great number of drive cleaning products have come out. Thankfully, most of them have been the "wet-system" type that use a cleaning fluid applied to a non-abrasive disk. Automation Facilities' Floppiclene is one of the more expensive kits on the market, but it's a good one and is worth consideration.

The Floppiclene kit consists of a disk sleeve, a number of cleaning disks (20 in the one I tested), a spray can of Safeclene head cleaner and two Safeclens anti-static screen cleaning wipes. To use the disk drive cleaner, you spray the head cleaner on one of the disks, insert it in the sleeve, put that in the drive and run the drive for 30 seconds. (On the CoCo, doing *DIR* twice takes care of that. Note that *all* of your drives, if you have more than one, run regardless of which one is being accessed.) The cleaning disk is then thrown away, unlike some other kits where you reuse a cleaning disk a dozen times or so.

The Safeclene head cleaner can also be used on audio tape heads; just spray it on an ordinary cotton swab and wipe the heads clean. (I don't think it would be a good cleaner for video recorder heads.) The Safeclens wipes are a good anti-static TV screen cleaner.

Floppiclene is a nice cleaning kit for your disk drives, tape recorder and TV or monitor screen.

(Automation Facilities Corp., 3916 State St., Santa Barbara, CA 93105, $34.95)

— Ed Ellers

One-Liner Contest Winner . . .

This is a typing test which flashes a random letter on the screen and waits for you to type it. After 25 letters it tells you how many you got right and the total time for all 25.

Dave Koscinski
Waterford, WI

The listing:

```
1 CLS:TIMER=0:FORQ=1TO25:H$=CHR$
(RND(26)+64):PRINT@240,H$:FORT=1
TO99999:A$=INKEY$:IFA$=""THENNEX
TT ELSEIFA$=H$THENR=R+1:NEXTQ:PR
INT"YOU HAD "R" OUT OF 25 RIGHT
IN"TIMER/60" SEC.":ENDELSENEXTQ:
PRINT"YOU HAD "R" OUT OF 25 RIGH
T IN "TIMER/60"SEC.":END
```

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Simulations* and its companion *Rainbow Simulations Tape*.)

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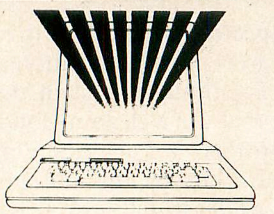

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Hot CoCo, Jan. '84 *"Super Screen represents a quality utility program that fills a definite need for the serious CoCo user. No other programs on the market so far have offered the error-trapping utility of Super Screen."*
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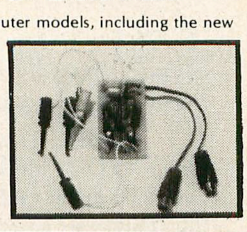

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The MDP Order Entry System is a family of programs which operate interactively by means of a "menu" selection scheme. Up to 900 products may be defined and a single disc system can hold over 600 transactions. When the operator selects a task to be performed, the computer loads a program designed to handle that task from the system disc. The system disc contains all of the programs required to create, update and maintain data files and prepare the necessary paperwork including shipping and invoice forms, daily sales reports, a monthly (or other period) sales report and a receivables report.

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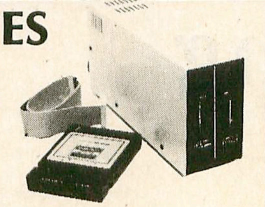

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Mark Data Products **SUPER BUG** is a powerful, *relocatable machine* code monitor program for your CoCo. If you are a beginner, the program and documentation are an indispensable training aid, helping you to gain a better understanding of your Color Computer and machine code programming. If you are an accomplished computerist, **SUPER BUG'S** capabilities, versatility and convenience will prove invaluable during programming and debugging.

SUPER BUG offers so many outstanding features that we are unable to list them all in this limited space but here are a few: hex and alpha numeric memory display, modify, search, and test; full printer support with baud rate and line feed select; up to 220 breakpoints; mini object code disassembler; 64K mode setup; decimal, hex and asci code conversion routines and extensive documentation.

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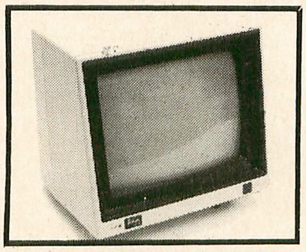

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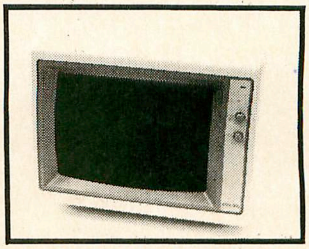

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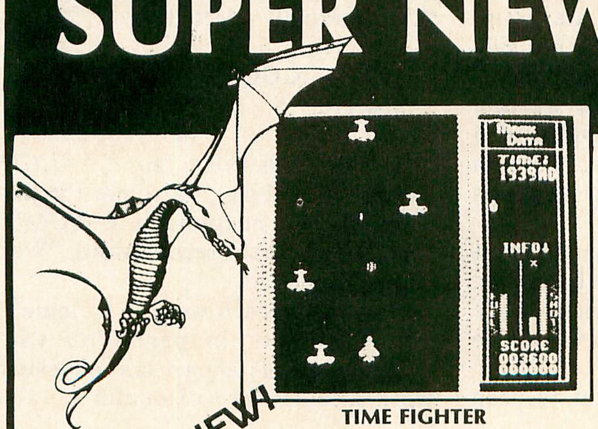

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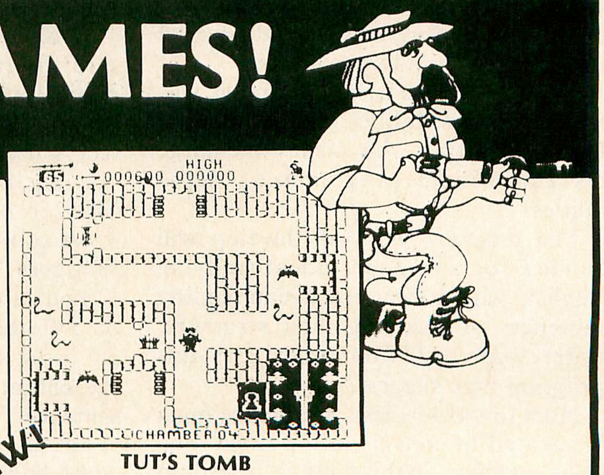

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Using Tables To Assist In Programming

By Joseph Kolar
Rainbow Contributing Editor

You never know where you may find an idea to send you off on a frenzy of programming creativity.

Leafing through a Rumanian grammar book, it was noted that interesting tables were included in each lesson to aid the student in creating a variety of practice sentences, so material covered in the lesson could be reviewed.

The method used, though simple, was filled with possibilities for the budding CoCo enthusiast who wishes to enlarge his educational programming capabilities.

The program we shall develop will be ideal for a foreign student studying English, who desires practice in reading sentences or studying their structure. Surely, you will find other uses this program may suggest.

Now to work! First, a sentence must be created to convert into a table. The basic sentence, in this case, is "I see him opening the door." We expand this to create many possible sentences (see Table 1).

Here is how it works. Read across from left to right, selecting one word from each column, being careful not to cross any horizontal line. For instance, you might choose "We" from Column 1 and "sees" from Column 2, etc.

Look over the table carefully to make sure the possible sentences are grammatically correct and they are not silly or improbable. A grammatically incorrect sentence would be "Joe see him opening the book." If we substituted "Joe" in place of "George" in Column 3, we could get an unlikely sentence as "Joe sees Joe," etc.

You can readily see that an awful lot of different sentences can be made, choosing one word from each of the six columns to comprise a complete sentence.

Let us beginners see what we can come up with!

We shall begin at Line 100, reserving lines 0-99 for a title and instructions. Key in:

```
100 CLS
```

Referring to our homemade Table 1, we note that we have five words in the first column. In order to select the five words in a random order to begin our sentence, we must resort to the *RND(x)* function. Key in:

```
110 X =RND(5)
```

We must also send the computer to different program line numbers when 'X' is internally selected.

```
120 ON X GOTO 130,140,150,
160,170,
```

This line tells CoCo that if *X=1, GOTO* program Line 130 where the first word, "I," will be found; if *X=2, GOTO* Line 140 where the second word, "We," will be found etc.

Now assign each word in Column 1, a line number in pencil on your homemade table using it as a convenient work sheet. Refer to Column 1, Table 2.

```
130 PRINT "I";:GOTO 180
```

We indent two spaces, key in the word to which you assigned the line number and skip a space. After the closing quotation mark add a semicolon to indicate the next word follows

---

(Joseph Kolar is a free-lance writer and programmer dedicated to proselytizing for computers in general, and the CoCo specifically.)

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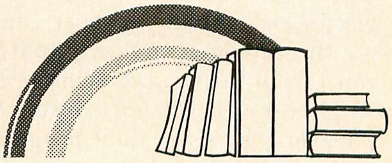

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immediately after. Put a colon to separate units of a multiple statement and add a *GOTO* statement with the location of the next word to follow. Mark "see" Column 2, Table 2 on your work sheet, assigning it Line 180.

```
140 PRINT "WE";:GOTO 180
150 PRINT "YOU";:GOTO180
```

Note that the words to which you assigned lines 160 and 170 require "sees" instead of "see." In pencil, on your worksheet, assign Line 190 to "sees." Lines 160-170 will be similar in format to lines 130-150, except that they will tell CoCo to *GOTO 190*. Key in lines 160 and 170 at this time.

```
160 PRINT "JOE";:GOTO 190
170 PRINT "OLIMPIA";:
GOTO 190
```

Add the following lines:

```
180 PRINT"SEE";:GOTO500
190 PRINT"SEES";:GOTO500
500 GOTO 500
```

Note: Do not insert a space in front of either "see" in Line 180 or "sees" in Line 190. This space between the first and second words was taken care of by putting the space after each of the five words in lines 130-170.

At this point, check to see if all is well. *RUN* repeatedly until all five words in Column 1 appear randomly on the screen with their appropriate word from the second column. Correct any boo-boos! Do not consult Listing 1 because it is the final program and somewhat different from the work in progress.

When you are satisfied with your work, above the third column, pencil in *200 RND(5*. This reserves a line for *RND*. Assign to the five words in this column the next five line numbers.

EDIT lines 180 and 190 to *GOTO 200* instead of 500. The *GOTO 500* was just temporary to allow us to check our work. It is not necessary to direct Line 190 with *GOTO200* because CoCo knows it is the next line in the listing. Add it anyway to make the listing easier to follow.

```
200 X=RND(5)
```

1	2	3	4	5	6
I		HIM			DOOR.
WE	SEE	HER		A	WINDOW.
YOU		THEM	OPENING	THE	BOOK.
JOE	SEES	GEORGE	SHUTTING		DICTIONARY.
OLIMPIA		DIANA			

TABLE 1

1 110 RND(5) 120	2	3 200 RND(5)	4 260 RND(2)	5 290 RND(2)	6 320 RND(4)
130 I		210 HIM			330 DOOR.
140 WE	180 SEE	220 HER		300 A	340 WINDOW.
150 YOU		230 THEM	270 OPENING	310 THE	350 BOOK.
160 JOE	190 SEES	240 GEORGE	280 SHUTTING		360 DICTIONARY
170 OLIMPIA		250 DIANA			

370

TABLE 2

Since we have five words in the third column, we shall make a multiple statement by adding to Line 200 *:ON X GOTO 210,220,230,240,250*. Did you remember to assign the five words in the third column, lines 210-250? Key in lines 210-250 and add *GOTO500* to each of lines 210-250 as a temporary aid so we can check out our work.

RUN and check the spelling, and make sure there is just one space between the second and third words. If the third word does not follow the second properly, but falls on the next line, you may have omitted the semicolon in lines 180 or 190. If you have two spaces instead of one, check to see if you put a space after the opening quotation mark in any of lines 210-250.

When you are ready to proceed, on your worksheet above Column 4 write *260 X*=RND(2) because there are only two choices in this column. Assign 270 and 280 to the two words in Column 4.

EDIT lines 210-250, changing 500 to 260. Make a multiple line statement in Line 260 as you had done in Line 200.

```
260X=RND(2):ON X GOTO 270,280
```

```
270 PRINT"OPENING ";:
GOTO 500
280 PRINT"SHUTTING ";:
GOTO 500
```

RUN and check for mistakes as previously explained. If all is well, drop the sentence to the middle of the screen with either of the Line 105s listed:

```
105 PRINT:PRINT:PRINT:
PRINT:PRINT:PRINT
```

```
105 FOR I=1 TO 6:PRINT:NEXT
```

RUN and BREAK repeatedly; notice that the length of the sentences in progress will vary.

"Olimpia sees George opening" has only two spaces left at the right margin. This indicates the rest of the sentence must be placed on the next screen line.

EDIT lines 270-280 so they read:

```
270 PRINT"OPENING":GOTO290
280  PRINT"SHUTTING":GOTO290
```

Since these two words will be the last on the first screen line, notice that a space is not required after the word or a semicolon, because no more words will follow. However, since we will locate the second line using *PRINT@*, you could leave the space and semicolon in and they would be harmless.

By now you know what to write in pencil above the fifth column, and what line numbers to assign the two words. Refer to Table 2, if in doubt.

```
290 XRND(2):ON X GOTO 300,310
300 PRINT25,“A ”;:GOTO500
310 PRINT@224,“ THE ”;:
GOTO500
```

We used *PRINT@* to locate the first character one space in from the left margin. Note the two variant ways to do this.

At this point, put in the appropriate information above and in Column 6. Again, refer to Table 2, if in doubt.

EDIT lines 300-310 by changing 500 to 320.

```
320 X=RND(4):ON X GOTO 330,340,
350,360
```

Write 370 below the lower right-hand corner of Table 2 to indicate the line number that takes us out of the table.

```
330 PRINT“DOOR.”:GOTO370
```

Key in lines 340-360 making sure you use a period for proper punctuation. Do not use a semicolon.

```
370 GOTO 370
```

Delete line 500. *RUN* and correct any errors. Notice that the shorter sentences are off-center tending toward the left. You can compensate for this to some degree by editing lines 130 and 140. Insert four additional spaces between the first quotation mark and the first letter. This should result in six spaces in those two lines. The words in lines 150-160 are a bit longer so just insert three spaces to make a total of five spaces between the opening quotation mark and the first character. Finally, insert one space in Line 170 to make it a total of three spaces.

RUN and check it out. Not perfect, but good enough for us beginners. Rewrite Line 370.

```
370 A$=INKEY$:IF A$=“G”THEN
CLS:GOTO 100 ELSE 370.
```

We told CoCo to leave the sentence displayed on the screen until the ‘G’ key is pressed, at which point to clear the screen; choose and display the next sentence.

You are left to your own devices to create a title. It may be better to wait until next month as we plan to delve further into this programming area. Save this program on tape.

A sample instruction was created in lines 50-60 in Listing 1. Since there is only one sentence displayed, an ending panel would be a waste of time. Just turn off CoCo when you are finished running through the sentences.

The beginner programmer has one tremendous advantage over the professional. Usually, the beginner has a specific person/persons in mind when he creates a program. With a little thought, he can generally personalize his program by inserting personal names to become an integral part of the program. Note in Column 1, Table

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1, instead of using "he" or "she," I use my name and a friend's name for whom the program was designed. Note, also, the two names used in Column 3, Table 1. Again, people who might use the program.

Everybody is fascinated to see their names pop up on the screen. This inducement adds to their interest, costs nothing and generates good will. So, consider substituting the personal names in the program with those of yourself and friends. Be careful to use names with eight or less characters. Otherwise, you will have to adjust the first word in the sentence to avoid splitting words between lines!

More on this next month.

Listing 1

```
0 'LISTING1
50 CLS(0): PRINT@128,"  TO STUDY
 THE SENTENCES IN THISPROGRAM, P
RESS THE <G> KEY.  RE-PEAT THIS
PROCEDURE UNTIL YOU   ARE FINISH
ED WITH THE TABLE."
60 PRINT:INPUT "          PRESS
<ENTER>";OA
100 CLS
105 FOR I=1 TO 6:PRINT:NEXT
110 X=RND(5)
120 ON X GOTO130,140,150,160,170
130 PRINT"        I ";:GOTO180
140 PRINT"        WE ";:GOTO180
150 PRINT"       YOU ";:GOTO180
160 PRINT"       JOE ";:GOTO190
170 PRINT"   OLIMPIA ";:GOTO190
180 PRINT"SEE ";:GOTO200
190 PRINT"SEES ";:GOTO200
200 X=RND(5):ON X GOTO210,220,23
0,240,250
210 PRINT"HIM ";:GOTO260
220 PRINT"HER ";:GOTO260
230 PRINT"THEM ";:GOTO260
240 PRINT"GEORGE ";:GOTO260
250 PRINT"DIANA ";:GOTO260
260 X=RND(2):ON X GOTO270,280
270 PRINT"OPENING":GOTO290
280 PRINT"SHUTTING":GOTO290
290 X=RND(2):ON X GOTO 300,310
300 PRINT@225,"A ";:GOTO320
310 PRINT@224," THE ";:GOTO320
320 X=RND(4): ON X GOTO330, 340,
350,360
330 PRINT"DOOR.":GOTO370
340 PRINT"WINDOW.":GOTO370
350 PRINT"BOOK.":GOTO370
360 PRINT"DICTIONARY.":GOTO370
370 A$=INKEY$: IF A$="G" THEN CL
S:GOTO100 ELSE370
```

Listing 2

```
0 '***ALT2  THE DISPLAY   WILL P
AUSE FOR ABOUT 10 SECONDS.  YOU
CAN GUESS WHAT THE DESIGN WILL B
E.
2 '***THE SOUND WILL BEEP 20
TIMES.  IF YOU NEED MORE TIME,
YOU MUST PRESS <SHIFT><@> TO
HOLD THE DISPLAY.  WHEN READY TO
CONTINUE, PRESS ANY KEY.
3 '***IT TAKES ABOUT 4-5 MINUTES
TO DRAW THE DESIGN, SO BE A LIT-
TLE PATIENT!
30 PMODE3:PCLS:PMODE4
40 A=128:B=92:R=70:P=2.3
50 DIMS(2)
60 DRAW"BM0,0BF2L2D2R2D2R2U2R2U2
L2U2L2D2"
70 GET(0,0)-(6,6),S,G
80 PCLS:SCREEN1,1
175 FOR D=10 TO 10
180 FOR Z=1 TO 755 STEP 2:C=Z
190 C=90+C*P/SQR(D)/SQR(D)
195 K=90+C*P*180
200 X=INT(A+R*COS(K)):Y=INT(B+R*
SIN(C))
210 PUT(X,Y)-(X+7,Y+5),S.PSET
240 IF Z=101 THEN FORQ=1 TO 20:S
OUND50,4:NEXT
250 NEXT Z,D
255 PLAY"O3L8FAFL16FAFECEL8FAFEC
EL4ECCP2"
260 GOTO260
```

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Relief for type-weary fingers

FILECOPY — A Handy OS-9 Utility

By Gerry Schechter

If you have a disk system, you know what a hassle it can be when you want to copy several files from one disk to another. All that typing in of the *COPY* command can really wear your poor fingers to the bone. With OS-9 and its multilevel directories, the problem is even worse. For example, to copy just one file, you would have to enter the following: *COPY /DO/CMDS/FORMAT/DI/NEWCMDS/FORMAT.* Needless to say, if you have a dozen or so files to copy, it could take quite a while.

I decided my computer should do most of the work for me, so I set out to write a BASIC09 program to take care of all that typing. This in itself was an experience, since I had never written a BASIC09 program before. With my trusty manual in hand, I came up with *FILECOPY.*

FILECOPY, as its name suggests, is a utility program that will copy files from one disk to another. Using it is very simple. All you have to do is to enter the input pathname, such as */DO/CMDS*, and the output pathname, such as */DI/NEWCMDS.* The program will then take care of the rest by prompting you to see which files you want to copy. Any time it asks you a question, you merely enter a 'Y' for yes, or anything else for no. The way it works is quite interesting, and it shows off some of the powers of OS-9 and BASIC09.

It starts off by creating a file of the input pathname. It does this by redirecting the output from the *DIR* command to a disk file. This file is then read and the filenames are extracted from it.

Making liberal use of the *ON ERROR* statement, the program will also determine if the file already exists in the output pathname. If it does, it asks you if you would like to rewrite the file. The program will also let you know if you try to copy a directory, or if you have no more room left on the disk.

As with any computer program, *FILECOPY* could be enhanced some. The first thing that comes to mind is to have it run itself recursively in order to copy a directory along with some or all of its files.

I hope this program will encourage you to delve deeper into the marvelous OS-9 operating system. For those of you who really hate typing, I would be happy to send you a copy of the program for only $1, if you send a blank disk and SASE to: 75 Midland Terrace, Yonkers, NY 10704.

(Gerry Schechter has over 12 years of data processing experience. He is currently employed by the Mercy College where he is the manager of technical services. His hobbies include writing software for the Color Computer.)

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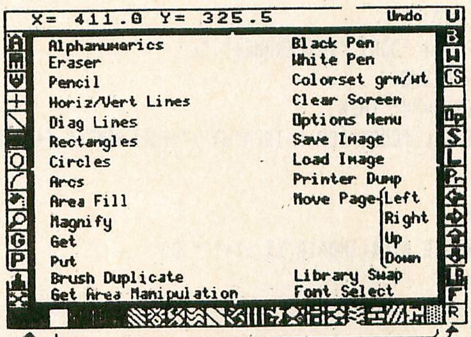
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Get
Put
Brush Duplicate
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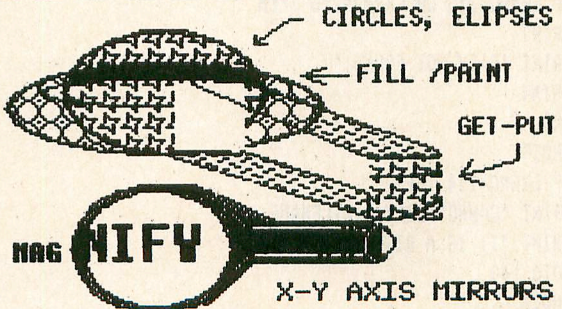
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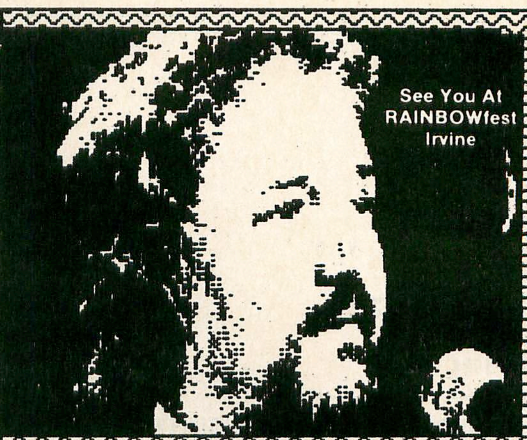
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The listing:

```
PROCEDURE FILECOPY
REM FILE COPY UTILITY  V1.0
REM GERRY SCHECHTER
REM 75 MIDLAND TERRACE
REM YONKERS, NY 10704
REM MARCH 1984
REM ----------------------
DIM INPATH,OUTPATH,FNAME,FILENAME:STRING[24]
DIM ERRNO,DISK,XX:INTEGER
DIM INDATA:STRING[80]
DIM YESNO:STRING[1]
DIM SD:STRING[3]
DIM FIRST:BOOLEAN
FIRST:=TRUE
ON ERROR GOTO 160
PRINT CHR$(12);
PRINT "    ** FILE COPY UTILITY **"
PRINT
PRINT "DO YOU HAVE MORE THAN"
INPUT "ONE DISK DRIVE ? ",YESNO
IF YESNO="Y" THEN
SD=""
ELSE
SD=" -S"
ENDIF
PRINT
INPUT "ENTER INPUT PATH:",INPATH
PRINT
INPUT "ENTER OUTPUT PATH:",OUTPATH
PRINT
PRINT "ONE MOMENT PLEASE.."
PRINT
PRINT "LOADING COPY COMMAND."
SHELL "/DO/CMDS/LOAD /DO/CMDS/COPY"
PRINT "CREATING DIRECTORY FILE."
100 SHELL "/DO/CMDS/DIR "+INPATH+" >/DO/FILECOPY.DIR"
FIRST:=FALSE
OPEN #DISK,"/DO/FILECOPY.DIR":READ
READ #DISK,INDATA
PRINT CHR$(12)
PRINT "FILE COPY FROM:",INPATH
PRINT "             TO:",OUTPATH
PRINT
110 READ #DISK,INDATA
IF EOF(#DISK) THEN
GOTO 150
ENDIF
FNAME=""
FOR XX=1 TO LEN(INDATA)
IF MID$(INDATA,XX,1)=" " THEN
FILENAME=FNAME
GOSUB 120
ELSE
FNAME=FNAME+MID$(INDATA,XX,1)
ENDIF
NEXT XX
GOTO 110
120 PRINT "COPY "+FILENAME+" ";
INPUT YESNO
IF YESNO="Y" THEN
130 SHELL "COPY #8K "+INPATH+"/"+FILENAME+" "+OUTPATH+"/"+FILENAME

+SD
ENDIF
140 WHILE MID$(INDATA,XX,1)=" " DO
XX=XX+1
ENDWHILE
XX=XX-1
FNAME=""
RETURN
150 CLOSE #DISK
PRINT
PRINT "PROCEDURE CONCLUDED."
PRINT
END
160 ERRNO:=ERR
IF ERRNO=218 THEN
IF FIRST THEN
PRINT "DELETING OLD DIRECTORY FILE."
DELETE "/DO/FILECOPY.DIR"
GOTO 100
ELSE
PRINT FILENAME+" ALREADY EXISTS"
INPUT "DO YOU WISH TO REWRITE IT ? ",YESNO
IF YESNO="Y" THEN
SHELL "/DO/CMDS/DEL "+OUTPATH+"/"+FILENAME
GOTO 130
ELSE
GOTO 140
ENDIF
ENDIF
ENDIF
IF ERRNO=215 OR ERRNO=216 THEN
PRINT
PRINT "PATH NOT FOUND!"
PRINT
END
ENDIF
IF ERRNO=214 THEN
PRINT "CANNOT COPY "+FILENAME
PRINT "IT IS A DIRECTORY."
GOTO 140
ENDIF
IF ERRNO=248 THEN
PRINT "DISK IS FULL!"
PRINT "PROCEDURE ABORTED."
END
ENDIF
PRINT
END "OS9 ERROR # "; ERRNO; " HAS OCCURRED!"
```

RAINBOW Info

How To Read Rainbow

Please note that all the BASIC program listings you will find in THE RAINBOW are formatted for a 32-character screen—so they will show up just as they do on your CoCo screen. One easy way to check on the accuracy of your typing is to compare what character "goes under" what. If the characters match — and your line endings come out the same — you have a pretty good way of knowing that your typing is accurate.

We also have "key boxes" to show you the *minimum* system a program needs. But, *do* read the text before you start typing.

Finally, the little cassette symbol on listings indicates that program is available through our RAINBOW ON TAPE service. An order form for this service is on the insert card bound in the magazine.

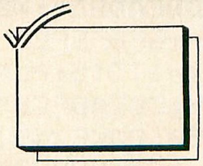
What's A CoCo

CoCo is an affectionate name which was first given to the TRS-80 Color Computer by its many fans, users and owners. As such, it is almost a generic term for three computers, all of which are very much alike.

When we use the term CoCo, we refer to the TRS-80 Color Computer, the TDP System-100 Computer and the Dragon-32 Computer. It is easier than using the three "given" names throughout THE RAINBOW.

In most cases, when a specific computer is mentioned, the application is for that specific computer. However, since the TDP System-100 and TRS-80 Color are, for all purposes, the same computer in a different case, these terms are almost always interchangeable.

The Rainbow Check Plus



The small boxes that you see accompanying programs in the THE RAINBOW are the "Check system," which is designed to help you type in programs accurately.

Rainbow Check PLUS will count the number and values of characters you type in. You can then compare the number you get to those printed in THE RAINBOW. On longer programs, some benchmark lines are given. When you reach the end of one of those lines with your typing, simply check to see if the numbers match.

To use the *Rainbow Check PLUS*, type in the program and *CSAVE* it for later use, then type in the command *RUN* and press ENTER. Once the program has run, type *NEW* ENTER to remove it from the area where the program you're typing in will go.

Now, whenever you press the down arrow key, your CoCo will give you the checksum based on the length and content of the program in memory. This is to check against the numbers printed in THE RAINBOW. If your number is different, check the listing carefully to be sure that you typed in the correct BASIC program code. For more details on this helpful utility, refer to H. Allen Curtis' article on Page 21 of the February 1984 RAINBOW.

Since *Rainbow Check PLUS* counts spaces and punctuation, be sure to type in the listing exactly the way it's given in the magazine.

```
10 CLS:X=256*PEEK(35)+178
20 CLEAR 25,X-1
30 X=256*PEEK (35)+178
40 FOR Z=X TO X+77
50 READ Y:W=W+Y:PRINT Z,Y;W
60 POKE Z,Y:NEXT
70 IFW=7985THEN80ELSEPRINT
"DATA ERROR":STOP
80 EXEC X:END
90 DATA 182, 1, 106, 167, 140, 60, 134
100 DATA 126, 183, 1, 106, 190, 1, 107
110 DATA 175, 140, 50, 48, 140, 4, 191
120 DATA 1, 107, 57, 129, 10, 38, 38
130 DATA 52, 22, 79, 158, 25, 230, 129
140 DATA 39, 12, 171, 128, 171, 128
150 DATA 230, 132, 38, 250, 48, 1, 32
160 DATA 240, 183, 2, 222, 48, 140, 14
170 DATA 159, 166, 166, 132, 28, 254
180 DATA 189, 173, 198, 53, 22, 126, 0
190 DATA 0, 135, 255, 134, 40, 55
200 DATA 51, 52, 41, 0
```

Using Machine Language

Machine Language programs are one of the features of THE RAINBOW. There are a number of ways to "get" these programs into memory so that you can operate them.

The easiest way is by using an Editor-Assembler, a program you can purchase from a number of sources.

An editor-assembler allows you to enter mnemonics into your CoCo and then have the editor-assembler assemble them into specific instructions that are understood by the 6809 chip that controls your computer.

When you use an editor-assembler, all you have to do, essentially, is copy the relevant instructions from THE RAINBOW'S listing into CoCo.

Another method of getting an assembly language listing into CoCo is called "hand assembly." As the name implies, you do the assembly by hand. This can *sometimes* cause problems when you have to set up an ORIGIN statement or an EQUATE. In short, you have to know something about assembly to hand assemble some programs.

Use the following program if you wish to hand assemble machine language listings:

```
10 CLEAR200,&H3F00:1=&H3F80
20 PRINT "ADDRESS:";HEX$(I);
30 INPUT "BYTE";B$
40 POKE I,VAL("&H"+B$)
50 I=I+1:GOTO 20
```

This program assumes you have a 16K CoCo. If you have 32K, change the *&H3F00* in Line 10 to *&H7F00.*

The Rainbow Seal

RAINBOW
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SEAL

The Rainbow Certification Seal is our way of helping you, the consumer. The purpose of the Seal is to certify to you that any product which carries the Seal has been physically seen by us and that it does, indeed, exist.

Manufacturers of products — hardware, software and firmware — are encouraged by us to submit their products to THE RAINBOW for certification. We ascertain that their products are, in actuality, what they purport to be and, upon such determination, award a Seal. This lets you know that we have seen the product and that it does, indeed, exist.

The Seal, however, is not a "guarantee of satisfaction." The certification process is different from the review process. You are encouraged to read our reviews to determine whether the product is right for your needs.

There is absolutely no relationship between advertising in THE RAINBOW and the certification process. Certification is open and available to any product pertaining to CoCo. A Seal will be awarded to *any* commercial product, regardless of whether the firm advertises or not.

We will appreciate knowing of instances of violation of Seal use.

GRAPHICS

16K ECB

Different Sights and Sounds With Graphics Bazaar

By Paul Vernon Miller

Here's a program in which you have to do absolutely nothing except type *RUN* and press ENTER! *Graphics Bazaar* is a BASIC program requiring a 16K Extended CoCo. It consists of three graphics screens, each running for five cycles and changing according to the value in the *FOR . . . NEXT* loop in Line 5.

The basic premise running throughout the whole program is the switching of the on screen design between different *PMODEs* and *SCREENs* while playing a series of sounds (lines 13, 24 through 26, and 31 through 33). Each of the three screens uses the 'pattern *POKE*' at one time or another, which creates some interesting effects when using this switching routine. The program uses a BREAK key disable (Line 3) and a speedup *POKE* (Line 2) to help the sound and graphics flow more smoothly. Most of the sounds in the program are contained in string statements (lines 34 through 45). These sounds were contrived through a great deal of experimentation with the *PLAY* command. Some of these sound strings use the effective volume controls, V+; and V-;, to increase or decrease the volume.

Screen one can start from either side of the screen, depending on what happens in the random statement in Line 6. Screen one (basically Line 9) alternates between *PMODEs 1, 3,* and *4,* creating a series of mirages and bright flashes. It also employs a 'Box Subroutine', which does nothing more than add a 'B' to both *LINE* statements and uses the 'pattern *POKE*' to paint around these boxes, creating bright colors in *PMODE4*.

The idea behind the circular line patterns in screen two and three was borrowed from the ECB manual. A little knowledge of trigonometry is required to understand the 'hows' and 'whys' of this technique (lines 18 and 29 through 30), but even if you don't understand the reason behind it, you can still experiment to gain the desired results.

The program will continually renew the global loop in Line 5 and run forever, so just push the Reset button to exit the program. I hope you enjoy *Graphics Bazaar*. Happy computing.

(Paul Vernon Miller is attending Brigham Young University. He enjoys computer programming as a hobby, and plans to major in electrical or mechanical engineering.)

9	251
18	28
24	28
36	72
40	183
END	255

The listing:

```
0 ' GRAPHICS BAZAAR
1 ' TITLE SCREEN
2 POKE65495,0:CLS:GOSUB35:DIMR(1
6):K=178:PRINT@101,"GRAPHICS":PR
INT@169,"BAZAAR":PRINT@239,"BY":
PRINT@306,"PAUL":PRINT@373,"MILL
 ER":PLAY"T255L255V104":FORX=1TO3
0:PLAY"V+;ADBEADBE":NEXTX:FORX=1
TO30:PLAY"V-;GFGFEFEF":NEXT
3 PRINT:FORX=1TO15:PLAY"V+;O4ABC
DEFGFEDCBAV+;CDEABFCD":PRINT:NEX
TX:POKE248,50:POKE249,98:POKE250
,28:POKE251,175:POKE252,126:POKE
253,173:POKE254,165:POKE410,126:
POKE411,0:POKE412,248
4 ' SCREEN 1
5 FORQ=1TO5:X=RND(-TIMER):PLAY"V
4":PMODE4,1:PCLS:SCREEN1,1:IFQ=2
ORQ=5THENM=3ELSEIFQ=4THENM=1ELSE
M=4
6 R=RND(0):IFR>.5THENX=4:Y=196:Z
=4ELSEX=196:Y=4:Z=-4
```

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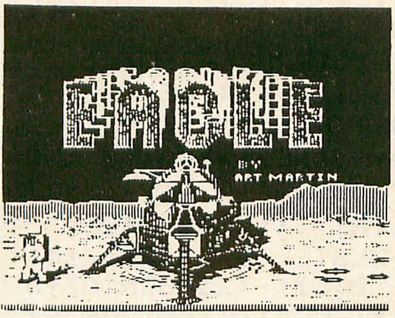

EAGLE

A graphic-enhanced lunar lander simulator. The pilot breaks out of lunar orbit and attempts a soft landing on the lunar surface. Joysticks control thrust and craft altitude and information is continually displayed on horizontal and vertical velocities, acceleration values, vertical and horizontal distances from target, fuel consumption and much more. On advanced levels, problems such as fuel leaks and computer screen failures can provide hair-raising final approaches. Disk version allows choice of landing site between Mars and Earth's moon. Takeoffs from the surface can be made and the upper stage placed back in orbit. The simulation is as educational as it is fun and exciting. A great tool for that future astronaut or physicist. 32K, 2 joysticks required. Available in tape or an enhanced disk version.

Tape - $24.95 Disk or Amdek - $29.95

SKETCHPAD

Sketchpad is a graphics drawing program designed to provide the computer hobbyist with easy manipulation of the powerful graphics capabilities of the Coco. Advanced programmers can design graphics screens and characters for Basic and ML programs and games. Sketchpad was used to create the graphics for "Eagle."

Two joysticks control cursors that provide end-points and boundaries for lines, boxes, circles, ellipses and painting. Point-to-point drawstrings may be plotted on the screen and then rotated, enlarged or shrunk, moved or inverted. Patterns may be programmed in easily to create dazzling illusions using lines, boxes, circles, ellipses and drawstrings. Sketchpad supports all PMODES and color sets and gives false colors in Pmodes 1 and 4. Text and graphics can be combined on high-resolution screens. All pictures and drawstrings can be saved to disk for future use. 32K, 2 joysticks required. Disk only. $29.95.

TDIR

Tape Directory

TDIR is a menu-driven, user-friendly tape directory program. When installed and maintained on your cassette tapes, it allows complete directory control of your tapes. This means you will no longer need to go through a complete tape to discover that the program you wanted is on another tape.

TDIR also eliminates the drudgery of trying to remember tape position settings, or program names. All this, and more, is controlled by TDIR. 16K tape, $24.95.

MAYCODE

Disassembler For The TRS-80™ Color Computer

A 6809 disassembler. It will read Object Codes from memory and convert them to standard 6809 assembly language mnemonics, which can be disassembled to the screen, printer, cassette, or disk. When output is to tape or disk, the source code can then be loaded into EDTASM for modification, even changing the origin address. 16K min., 32K recommended. Tape, $24.95. Disk or Amdek, $29.95.

TESTMAKER

The TESTMAKER series is a menu-driven, user-friendly system of programs. These programs are internally linked, meaning that once you have begun, the program will automatically control the operation of the system.

TESTMAKER will allow the user to create both multiple choice and true-false tests. These tests may be run on the screen for an immediate test of the student or they may be printed and passed out to the class for a more standard exam.

TESTMAKER also has the feature of allowing an unlimited number of files with an unlimited file length. This means that the educator may create tests weeks, months, or years ahead and keep them on file until needed. This also means that each test may have as many questions as the educator wishes. 32K disk, $29.95.

The Digestive System

An educational quiz game for 2 players covering different areas of the human digestive system. Each question is assigned a point value relative to its difficulty. A fun way to learn about a serious subject. 16K.

The Circulatory System

Using the same format as "The Digestive System," this program covers the heart, lungs, veins, arteries, blood, etc. 16K.

BOTH ONLY:

Tape - $19.95 Disk or Amdek - $24.95

ALPHACOPY

The Disk Organizer

An alphabetized disk directory is great, but if that should crash it doesn't help tell you where the programs are. ALPHACOPY will write the programs in alphabetical order. Each program will be written on the same or consecutive sectors, making rebuilding of the disk much easier than the other currently available "zapping" utilities. 32K disk. Disk or Amdek, $24.95.

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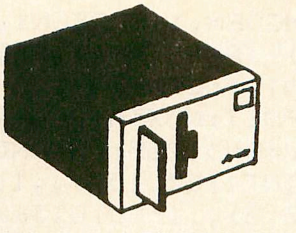

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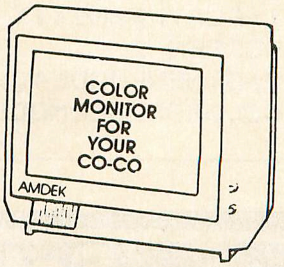

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```
7 PLAYA$:IFQ=3ORQ=5THEN11
8 FORA=X TO Y STEPZ:IFA=100THENP
LAYA$
9 PMODEM,1:SCREEN1,0:LINE(A-1,19
6-A)-(A+56,A-4),PSET:PMODE4,1:SC
REEN1,1:LINE(A-1,A-4)-(A+56,196-
A),PSET:NEXTA:PLAYA$:IFQ=1ORQ=4T
HENV=RND(255):W=RND(255):POKEK,V
:PAINT(150,150),,1:POKEK,W:PAINT
(150,5),,1:GOTO13ELSE13
10 ' BOX SUBROUTINE
11 FORA=X TO Y STEPZ:IFA=100THEN
PLAYA$
12 PMODEM,1:SCREEN1,0:LINE(A-1,1
96-A)-(A+56,A-4),PSET,B:PMODE4,1
:SCREEN1,1:LINE(A-1,A-4)-(A+56,1
96-A),PSET,B:NEXTA:PLAYA$:FORX=1
TO200:V=RND(255):POKEK,V:PAINT(V
,X),,1:NEXTX
13 PMODE4,1:PLAYI$:PLAYB$:PLAYC$
:PLAYD$:PLAYE$:PMODE3,1:SCREEN1,
0:PLAYF$:PLAYG$:PLAYH$:PLAYI$:PL
AYJ$:PLAY"V31":FORX=1TO10:PMODE3
,1:SCREEN1,1:PLAYM$:PMODE4,1:SCR
EEN1,1:PLAYK$:NEXTX
14 ' SCREEN 2
15 IFQ=5THENPMODE4,1:PCLS5:SCREE
N1,1:COLOR8ELSEPMODE4,1:PCLS:SCR
EEN1,1
16 LINE(0,96)-(255,96),PSET:LINE
(128,0)-(128,192),PSET:Y=0:FORX=
128TO255STEP4:LINE(128,Y)-(X,96)
,PSET:Y=Y+3:NEXTX
17 X=0:FORY=96TO192STEP3:LINE(X,
96)-(128,Y),PSET:X=X+4:NEXTY:Y=9
6:FORX=1TO128STEP4:LINE(X,96)-(1
28,Y),PSET:Y=Y-3:NEXTX:Y=192:FOR
X=128TO255STEP4:LINE(X,96)-(128,
Y),PSET:Y=Y-3:NEXTX:PLAY"V4O3"
18 FORT=30TO-25STEP-5:A=(2*3.141
5)*T/60:LINE(50,50)-(25*SIN(A)+5
0,25*COS(A)+51),PSET:LINE(205,50
)-(25*SIN(A)+205,25*COS(A)+51),P
SET:LINE(50,142)-(25*SIN(A)+50,2
5*COS(A)+142),PSET:LINE(205,142)
-(25*SIN(A)+205,25*COS(A)+142),P
SET:PLAY"V+;V+;AFAF":NEXTT
19 ' PAINT ROUTINE
20 IFQ=2THEN23ELSEIFQ=3ORQ=5THEN
24
21 CIRCLE(50,50),26:CIRCLE(205,5
0),26:CIRCLE(50,142),26:CIRCLE(2
05,142),26:FORX=1TO16:R(X)=RND(2
55):NEXTX:POKEK,R(1):PAINT(55,35
),,1:POKEK,R(2):PAINT(60,65),,1:
POKEK,R(3):PAINT(31,55),,1:POKEK
,R(4):PAINT(210,40),,1:POKEK,R(5
)
```

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Setting The Standards

Graphics and sound effects like never before on the CoCo. An exciting original arcade action game. Control your hero through a maze of moving conveyor belts. Outsmart bad guys and save Q.P. Doll. Over 1,000 frames of increasing difficulty.

100% ML, original title screen music, 1 or 2 players, colorful Hi Res graphics, exciting sound effects, joystick or keyboard input, pause feature, 8 digit scores and high score name entry. For **32K** CoCo and TDP-100.

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Strap yourself into the ultra responsive Formula I car and rev the throttle to fire 500 screaming horses to life. Your heart pounds in anticipation of the race. The green flag drops and you are slammed back into your seat as the field thunders off in a deafening roar.

An exciting racing game in colorful Hi Res graphics with realistic sound effects. Joystick or keyboard input. Joystick input is compatible with all joysticks. Many different tracks to choose from. For **32K** CoCo and TDP-100.

Cassette-34.95 **Disk-34.95**

Another exciting original arcade action game. Help Willy stock the warehouse while keeping up with incoming orders. Watch out for the antagonists who intend to make your day long.

Excellent graphics and sound effects. 100% ML, 1 or 2 players, demonstration mode, selectable difficulty, joystick or keyboard input, pause feature and high score list with name entry. For **32K** CoCo and TDP-100.

Cassette-34.95 **Disk-34.95**

COLORPEDE

This truly outstanding engineer designed, 100% ML game with multi-colored Hi Res characters and fast action will challenge the most avid arcade buff. 1 or 2 players with joysticks or keyboard. **COLORPEDE** slithers through the toad stools. Demonstration mode with top 5 scores. Pause feature. For **16K** CoCo and TDP-100.

Casssette-29.95 **Disk-34.95**

"...forefront of the pack..." **RAINBOW**, Dec. '82

ROBOTTACK

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```
22 PAINT(215,65),,1:POKEK,R(6):P
AINT(186,55),,1:POKEK,R(7):PAINT
(55,125),,1:POKEK,R(8):PAINT(60,
157),,1:POKEK,R(9):PAINT(31,147)
,,1:POKEK,R(10):PAINT(215,157),,
1:POKEK,R(11):PAINT(185,147),,1:
POKEK,R(12):PAINT(206,132),,1
23 POKEK,R(13):PAINT(1,120),,1:P
OKEK,R(14):PAINT(1,1),,1:POKEK,R
(15):PAINT(255,1),,1:POKEK,R(16)
:PAINT(255,120),,1:IFQ=4THENFORX
=1TO255STEP3:V=RND(255):POKEK,V:
PAINT(X,1),,1:V=RND(255):POKEK,V
:PAINT(X,190),,1:PAINT(X,80),,1:
PAINT(X,110),,1:NEXTX
24 PLAY"V31":FORX=1TO11:R=RND(0)
:IFR>.5THENR=1ELSER=0
25 S=RND(0):IFS<.5THENS=1ELSES=0
26 PMODE 3,1:SCREEN 1,R:PLAYK$:P
MODE4,1:SCREEN1,S:PLAYL$:NEXTX
27 ' SCREEN 3
28 IFQ=4THENPMODE4,1:PCLS5:SCREE
N1,1:COLOR8ELSEPMODE4,1:PCLS:SCR
EEN1,1
29 FORT=30TO-27STEP-3:A=(2*3.141
5)*T/60:LINE(128,96)-(75*SIN(A)+
128,75*COS(A)+96),PSET:LINE(25,2
5)-(75*SIN(A)+128,75*COS(A)+96),
PSET:LINE(230,167)-(75*SIN(A)+12
8,75*COS(A)+96),PSET:LINE(230,25
)-(75*SIN(A)+128,75*COS(A)+96),P
SET
30 LINE(25,167)-(75*SIN(A)+128,7
5*COS(A)+96),PSET:NEXTT:IFQ<3ORQ
=4THENV=RND(255):POKEK,V:PAINT(1
,1),,1ELSEPOKEK,250:PAINT(1,1),,
1:FORX=1TO300:V=RND(255):Y=RND(2
55):Z=RND(191):POKEK,V:PAINT(Y,Z
),,1:NEXTX
31 PLAY"V11":FORX=1TO20:R=RND(0)
:IFR>.5THENR=1ELSER=0
32 S=RND(0):IFS<.5THENS=1ELSES=0
33 PMODE3,1:SCREEN1,R:PLAYN$:PMO
DE4,1:SCREEN1,S:PLAYO$:NEXTX:NEX
TQ:GOTO5
34 ' SOUND STRINGS
35 A$="V+;V+;V+;V+;V+;V+;V+;V+;V
+;O1ABFFABCDEFGFEGEFEABGABFAAO2A
BCDEFGABADEFABCDEEBFGAO3ABDEFGAB
DEFGABDEFGABAEFGO4ABDEEFGABFECDE
ABGABEEBAAA"
36 B$="O5GFEDCBABCDEFGFEDCBAO4BC
DEFGFEDCBABCDEFGO3GFEDCBABCDEFGF
EDCBAO2ABCDEFGFEDBCAO1BCDEFGFEDC
BABCDEFGFEDCBAO2BCDEFGFEDCBABCDE
FGO3FDECBABCDEFGO4EDCBABCDEFGO5F
EDCBABCDEFGFEDCBABCDEFFFGGG"
37 C$="O4V10AAAAAAFFFFFFFAAAAAAF
FFFFFV15O2AAAAAAAFFFFFFFV20AAAAA
AAFFFFFFFGABACAADAAFAAV31O1AAAAAB
AAACAAADAAAFAAAFFFFFAAAAACAAACAA
FAAFFFFFACAAAAFAAFFFFFV15FFFFFAA
AAAAFFFFFGGGGGGAAAAAV6FFFFFAAAAA
GGGGGFFFFFAAAAAV3FFFFAAAAGGG"
38 D$="V3O1GGGGGFFAAAAV6AAAAAFFF
GABCDABDDDEEEAABBAAFFV10AABBBCAA
ACDDDFFFFGGGGGGGGV15AAAAFFFFFAAA
AAGGGGGDDDFFFBBBBV31ABCDEFGABCDE
FGABCDEFGO2AAAAFFFBBBBBGGGGAAAAA
BBBBBFFFFFFFAAAAAAAGGGGGGO3ABCDE
FGAAAABBBBBFFFFAAAAAGGGGGAAAAAGG
GGGBBBBBBAAAAAAFFFAABB"
39 E$="O3GGGGGAAAABBFFFFGGGAAAFF
FFBBBBBGGGGGGGAAAAABBBDDDGGGGGAA
AAFFFFFBBBGGGGO4AAAAAAAABBCCCCCC
CDDDDDDEEEEEEFFFFFGGGGABCDFFFFFF
AAAAGGGGGGGAAAADDAFADDDDDGGGGGGG
GG"
40 F$="AAAAAAADDDDDADBAAAAGGGGGG
GAAAAAAAFFFFFFBBBBBBGGGGGGO3AAAA
AFFFFFFBBBGGGGDDDDGGGGEEEEEAAAAA
AGGGGGGFFFFFFFBBBBBBAAAAACCCCCCF
FFFFFFBBBBGGGGGGO4FFFFFFFGGGGGGA
AAAFFFBBBGGGGGGGGAAAAGGAAAGGAABF
BBBO2V15AAAAAAFFFAAAGGGGBBBFFFAA
AABBBGGGGFFFFFFAAGGAAB"
41 G$="BBFFFAAAFFFGGAABBBGGGFFFA
AGGGAAADDDDV31O1AABBGGGFFAABBFFF
CCCGGGAAABBGGGGBBBAAFFFAAAGGGBBB
AAAAGGGCCFFFAAAFGFGFGFGFGFABABAB
ABACDDCDCDCDCDDCDAFFFFFAAAV20AAA
FFFFGGGGGAAABBBBFFFGGGABACDDABCD
FDABDFDABDFEFFFV15ABCDGGGAAABBFF
FAABBBGGGAAAFFFFBBBGC"
42 H$="V10ABCDGGAGAGBBBBBV5BBBCG
BCBGV3ABABABAB"
43 I$="O1V31AAAABABABABV15BBBBAB
ABABV31O2AAAAAABABABABABABV15BBB
BABABABABABV31O3BBBBBABABABABABA
BAV15AAAAAAABABABABABABABV31O4AA
AAAABABABABABV15BBBBBABABABABABA
BAV31FFFFFFFFFAFAFAFAFAFAFAFAFAF
AFAFAV15GGGGGGABABABABAGAGAGAGV1
0FFFFFABABABBABAFAFAFAFAFA"
44 J$="AFAFAV5DDDDDDADADADAV3BBB
BBABABABABV2ABABABABABABV1GGGGGG
GGGGGGGGGAAGAGAGAGAGAGAGAGAGAGAG
AGV31O3ABCDEFGABGGAAGAGAGAGAV15O
2BABABABCDCDCABCDCBCDV10O1ABABAB
CGCGCGCGV5ABABABV2GAGAGAGAV31O4A
BCDEFGABCDEFGABCDEFGABCDEFG"
45 K$="V-;O4GFEDCBABCDEFGFEDCBAB
CDEFGABCDEFGABCDEFG":L$="V-;O5FE
DCBABCDEFGABCDEFGABCDEFGABCDEFAB
CDEF":M$="V-;V-;O3ABABCFCFABABCF
CFO2ABCDEFGFEGFE":N$="V+;O3AAFAA
FAAFAAFGBBGBB":O$="O4AABCDEABFCD
CDEABFCD":RETURN:PCLEAR8
```

DISKTEST.UTL Source Code Listings

```
                   00100 ********************************************************
                   00102 *                 "PAGEFILL" SUBROUTINE                *
                   00104 ********************************************************
                   00110 * This subroutine fills the 256 byte page of memory    *
                   00112 * beginning at $400 (upper half of text meory) with a  *
                   00114 * repeating 3-byte pattern used for diskette testing.  *
                   00116 * The pattern is one of 5 predetermined patterns as    *
                   00118 * selected by a value passed from BASIC.               *
                   00120 * INPUT:                                               *
                   00122 *   Pattern # sent from BASIC via the USR arguement    *
                   00124 *    0 produces DB 6D B6 recurrent pattern             *
                   00126 *    1    "     6D B6 DB     "         "               *
                   00128 *    2    "     B6 DB 6D     "         "               *
                   00130 *    5    "     00 00 00     "         "               *
                   00132 *    8    "     FF FF FF     "         "               *
                   00134 * OUTPUT:                                              *
                   00136 *   256 Bytes in text memory - used as disk I/O buffer *
                   00138 ********************************************************
0000               00220        ORG    $0000
0000 34   7F       00230 START  PSHS   A,B,X,Y,U,DP,CC  Save everything
0002 BD   B3ED     00240        JSR    $B3ED       Get arg. (patt #) from BASIC
0005 33   8D 002D  00250        LEAU   PATTRN,PCR  Get start of pattern list
0009 33   CB       00260        LEAU   D,U         Get start of desired pattern
000B 10AE 8D 0023  00270        LDY    PAGADR,PCR  Get page start address
0010 6F   8D 0021  00280        CLR    LOOPCT,PCR  Initialize counter
0014 1F   31       00290 LOOP   TFR    U,X         Pattern start address to X
0016 A6   8D 001B  00300        LDA    LOOPCT,PCR  Get loop count
001A 81   55       00310        CMPA   #85         Check if done
001C 27   0E       00320        BEQ    LASTBY      If done go to finish
001E EC   81       00330        LDD    ,X++        Not done; Get 2 bytes from patt.
0020 ED   A1       00340        STD    ,Y++        Put in text page
0022 A6   84       00350        LDA    ,X          Get one more byte
0024 A7   A0       00360        STA    ,Y+         Put in page also
0026 6C   8D 000B  00370        INC    LOOPCT,PCR  Increment loop counter
002A 20   E8       00380        BRA    LOOP        Repeat the cycle
002C A6   84       00390 LASTBY LDA    ,X          Get last byte of pattern
002E A7   A4       00400        STA    ,Y          Put in page
0030 35   7F       00410        PULS   A,B,X,Y,U,DP,CC  Restore registers
0032 39            00420        RTS                Return from subroutine
                   00430 *                         Work areas
0033      0400     00450 PAGADR FDB    $0400
0035      00       00460 LOOPCT FCB    0
0036      DB       00470 PATTRN FCB    $DB
0037      6D       00480        FCB    $6D
0038      B6       00490        FCB    $B6
0039      DB       00500        FCB    $DB
003A      6D       00510        FCB    $6D
003B      00       00520        FCB    $00
003C      00       00530        FCB    $00
003D      00       00540        FCB    $00
003E      FF       00550        FCB    $FF
003F      FF       00560        FCB    $FF
0040      FF       00570        FCB    $FF
          0000     00580        END    START
00000 TOTAL ERRORS
```

These are the two assembly language program listings *Pagefill* and *Grantest*, that were left out of the "Block Out Those Troublesome Granules With *DISKTEST.UTL*" article on Page 89 of the January 1985 issue. As was stated in the article, the resulting code is contained in the main program; these listings will help you if you want to try modifying the machine language code.

```
                         00100 ***********************************************************
                         00112 *                   "GRANTEST" SUBROUTINE                 *
                         00114 ***********************************************************
                         00116 * This subroutine does disk I/O to all 9 sectors in an   *
                         00118 * addressed granule.  If an error is detected it aborts *
                         00120 * testing of the balance of the granule and returns an  *
                         00122 * error code to basic.                                  *
                         00124 * INPUTS:                                               *
                         00126 *   1. The following must have previously setup:        *
                         00128 *        - Read or Write code set in DSKCON table       *
                         00130 *        - Drive # and buffer address set in DSKCON table *
                         00132 *        - Write data previously set into buffer        *
                         00134 *   2. Basic must pass the track # and 1st/2nd granule  *
                         00136 *        information to GRANTEST via the USR argument e.g.*
                         00138 *        X=USRn(ARG)  Where ARG=256*Track+(0 or 1)      *
                         00140 *                             0 for 1st gran, 1 for 2nd gran*
                         00144 * OUTPUTS:                                              *
                         00146 *   1. Either:                                          *
                         00148 *        - The buffer data is written to the 9 sectors or *
                         00150 *        - The 9 sectors are read sequentially to the buf.*
                         00152 *   2. Results code returned to the calling variable (X)*
                         00154 *        0=No error                                     *
                         00156 *        1=Error in data track (0-16,18-34)             *
                         00158 *        2=Error in directory track (17)                *
                         00160 ***********************************************************
0000                     00230        ORG   $0000
0000 34    3F            00240 START  PSHS  A,B,X,Y,DP,CC       Save registers
0002 BD    B3ED          00250        JSR   $B3ED   Get arg (track & gran) from BASIC
0005 BE    C006          00260        LDX   $C006   Get DSKCON param table pointer
0008 A7    02            00270        STA   2,X     Put track # in DSKCON table
000A 86    09            00280        LDA   #9      Get const. for next calculation
000C 3D                  00290        MUL           Get sector # prior to 1st
000D 4C                  00300 SECTLP INCA          Increment cycle counter
000E 5C                  00310        INCB          Increment sector number
000F E7    03            00320        STB   3,X     Put sector # in DSKCON table
0011 1F    02            00330        TFR   D,Y     Save cycle counter and sector #
0013 AD    9F C004       00340        JSR   [$C004] Call DSKCON
0017 E6    06            00350        LDB   6,X     Get status from DSKCON
0019 27    10            00360        BEQ   ENDCHK  Branch if status=0 (no error)
001B E6    02            00370        LDB   2,X     Error! Get track # from DSKCON
001D C1    11            00380        CMPB  #17     Is it the directory track?
001F 26    05            00390        BNE   GRNBAD  Branch if not directory track 17
0021 CC    0002          00400        LDD   #0002   Directory bad! Get error code
0024 20    0E            00410        BRA   RETURN  Back to BASIC
0026 CC    0001          00420 GRNBAD LDD   #0001   Granule bad!  Get error code
0029 20    09            00430        BRA   RETURN  Back to BASIC
002B 1F    20            00440 ENDCHK TFR   Y,D     Get cyc counter and sector # back
002D 81    09            00450        CMPA  #9      See if done
002F 26    DC            00460        BNE   SECTLP  Go to next sector if not done
0031 CC    0000          00470        LDD   #0000   Done!  Get OK code
0034 BD    B4F4          00480 RETURN JSR   $B4F4   Send code back to BASIC
0037 35    3F            00490        PULS  A,B,X,Y,DP,CC  Restore registers
0039 39                  00500        RTS           Return from subroutine
           0000          00510        END   START
00000 TOTAL ERRORS
```

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SCHOOL IS IN THE HEART OF A CHILD

4K

Having Fun With Number Patterns

By Bob Albrecht and Ramon Zamora
Rainbow Contributing Editors

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- Critical evaluation of software based on extensive playtesting in family and related enviroments.
- Additional resources to consult: books, magazines, software publishers, networks, etc.
- Suggestions for interludes and fun times away from the computer (a must!): call the librarian for information; watch TV together and discuss it; work together as volunteers in a community project; take a winter awareness walk
- Whatever we learn from families we work with in Menlo Park or from you, our readers. Let's pool our knowledge and share our experiences as we learn from our children.

Copyright© 1984 by DragonQuest, P.O. Box 310, Menlo Park, CA 94026.

(Well-known author Bob Albrecht also writes the "Game Master's Apprentice" feature for THE RAINBOW *each month. Ramon Zamora is author and co-author of several books, co-founder of Computer Town USA!, and currently designing computer games for kids at Child Ware Corp. in Menlo Park, Calif.)*

An elementary school exercise: explore a number pattern. The student is shown the first few numbers in the pattern, then asked to guess the next number or the next few numbers.

Number patterns are favorite tools of the grand inquisitors who construct IQ tests. Students who pencil in the numbers the test constructors have in mind are assigned "high IQs." Creative students might do something entirely different and, of course, be tagged with "lower IQs."

Remove the fear of failure and number patterns become fun! Make it a game, controlled by the player. Make it a computer game using an ever-patient CoCo to present numbers, one by one, as requested by the game player. Only the player knows if he or she "wins" or "loses." And the player always knows when she or he has fun.

Let's begin with some easy number patterns. In these patterns, each number after the first is obtained by doing something to the previous number. For example:

1) 1, 2, 3, 4, 5 and so on. The first number is 1. After the first number, each new number is obtained by adding 1 to the preceding number.
2) 2, 4, 6, 8, 10 and so on. The first number is 2. Each successive number is obtained by adding 2 to the preceding number.
3) 1, 3, 5, 7, 9 and so on. The first number is 1. Each successive number is obtained by adding 2 to the preceding number.
4) 2, 5, 8, 11, 14, 17 and so on. The first number is 2. Each successive number is obtained by adding 3 to the preceding number.

The above patterns are simple sequences of numbers. The first number in the sequence is given, then each successive number in the sequence is obtained by adding something (always the *same* something) to the preceding number.

Easy to program! Our first program works like this:

1) The CoCo asks for the first number in the pattern and the number to be added to get the next number. Someone enters these numbers.
2) The CoCo then clears the screen and shows the first number in the pattern.
3) To get the next number, press the space bar. Or, to start over, press the CLEAR key.

Here is the program.

```
100 REM**NMBR PATTERNS SCH 11-1
199 '
200 REM**GET PATTERN NUMBERS
210 CLS
220 PRINT @480,;
230 INPUT "FIRST NUMBER "; S
240 INPUT "ADD-ON NUMBER"; A
250 PRINT: PRINT
299 '
300 REM**SHOW 'LATEST' NUMBER
310 PRINT @448, S
320 PRINT
399 '
400 REM**COMPUTE NEXT NUMBER
410 S = S + A
499 '
500 REM**TELL WHAT TO DO NEXT
510 PRINT @480, "FOR NEXT NUMBER
, PRESS spacebar"
520 PRINT "TO START OVER, PRESS
clear KEY";
530 K$=INKEY$:IF K$="" THEN 530
540 IF K$=" " THEN 310
550 IF K$=CHR$(12) THEN 210
    ELSE 530
599 END
```

Enter and *RUN* the program. It might go like this:

```
FIRST NUMBER ? 1
ADD-ON NUMBER? 1

1

FOR NEXT NUMBER, PRESS [SPACE BAR]

TO START OVER, PRESS [CLEAR KEY]
```

Reverse color

Reverse color

Press the space bar and see the next number.

```
FIRST NUMBER ? 1
ADD-ON NUMBER? 1

1

2

FOR NEXT NUMBER, PRESS [SPACE BAR]

TO START OVER, PRESS [CLEAR KEY]
```

Guess the next number, then press the space bar. Did you guess the CoCo's number? Is this an "educational activity?" A drill? A game?

We suggest you and a kid or two try some of the following patterns together.

First Number	Add-On Number	Pattern
1	1	1,2,3,4 and so on.
2	2	2,4,6,8 and so on.
0	1	0,1,2,3 and so on.
0	2	0,2,4,6 and so on.
1	2	1,3,5,7 and so on.
5	5	5,10,15,20 and so on.

Next, take turns entering the "first number" and "add-on number." The other person guesses the next number. As you all get good at this, try some tricky patterns.

First Number	Add-On Number	Pattern
10	10	10,20,30,40 and so on.
2	3	2,5,8,11 and so on.
0	3	0,3,6,9 and so on.
10	-1	10,9,8,7 and so on.

Start with easy patterns and go s-l-o-w-l-y, or as quickly as the child wants to go. Also, spend some time learning to read the words on the screen. Most of all, have fun!

Color LOGO

Lots of folks believe that LOGO is better than BASIC as a kid's first computer language, especially for younger kids. We agree. We have used LOGO on several computers, including the CoCo.

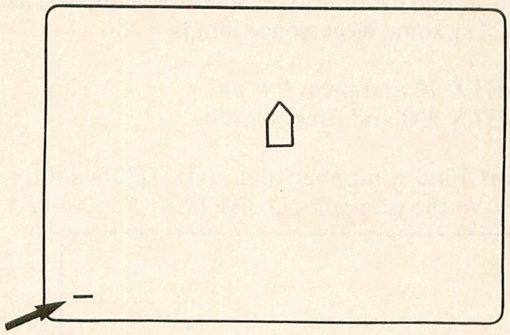
Unfortunately, Color LOGO is the worst LOGO we have seen, especially for kids. We wonder if the authors intentionally tried to make Color LOGO hard to understand. Nevertheless, we will try to suggest ways for you and your kids to explore Color LOGO. If you want to explore even further, get these booklets at your Radio Shack store: *Color LOGO Guide for Parents: Book One* by Ramon Zamora and Bob Albrecht, Cat. No. 26-2763, $3.95; or *Color LOGO Guide for Teachers: Book One* by Don Inman and Bob Albrecht, Cat. No 26-2761, $3.95.

Now set up Color LOGO in your CoCo so your screen looks like this.

```
     COLOR LOGO COPYRIGHT 1982
  LARRY KHERIATY & GEORGE GERHOLD
      LICENSE TO TANDY CORP
       ALL RIGHTS RESERVED
LOGO: _
```

Get ready to meet the turtle. You will find the turtle in the "Run" room. To get to the Run room, press the 'R' key.

Press the 'R' key and this is what you see:



This is called the cursor

The very unturtle-like shape near the center of the screen represents the turtle. Some home computers use a triangle. Atari does it best: the turtle looks like a turtle.

When you are in the Run room and see the cursor, you know it is your turn to do something.

Type your name and press the ENTER key. Here is what happened when Seemore the Wizard typed his name.

```
SEEMORE
I DONT KNOW HOW TO SEEMORE_
```

The cursor ends up here

Oops! Color LOGO doesn't know what Seemore wants it to do. If you typed your name, you probably saw a similar message.

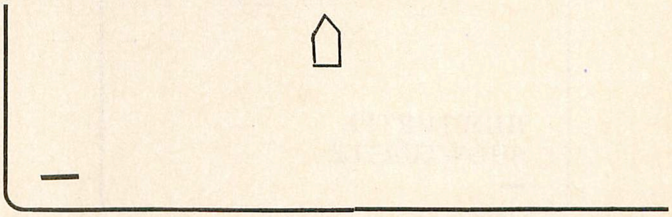
Ramon Saw:	I DON'T KNOW HOW TO RAMON_
Bob Saw:	I DON'T KNOW HOW TO BOB_

Note that the cursor ended up at the right end of the line. Press the ENTER key and the cursor will move down to the next line.

```
SEEMORE
I DONT KNOW HOW TO SEEMORE
_
```

The cursor moves down

Now type *CLEAR* and press ENTER. Poof! Everything disappears except the turtle and the cursor.



Let's play hide and find. Type: HIDETURTLE and press ENTER.

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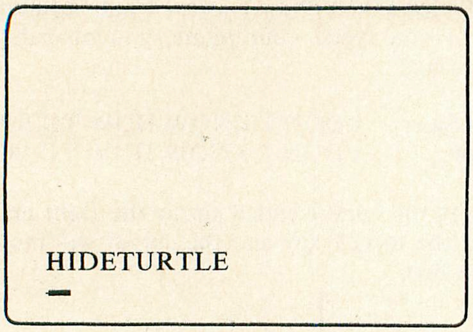
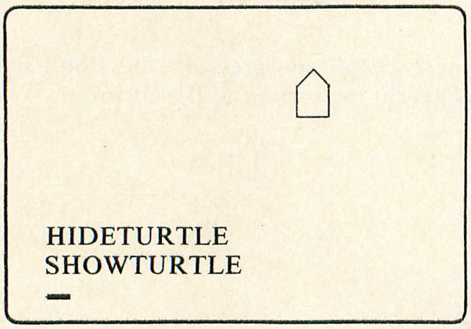


```
HIDETURTLE
```

How can we make the turtle reappear? Easy, type: SHOWTURTLE and press ENTER.



```
HIDETURTLE
SHOWTURTLE
```

By the way, the turtle's name is Telli. She likes to hide, then move about and reappear. Telli suggests that you can save time by using LOGO shorthand.

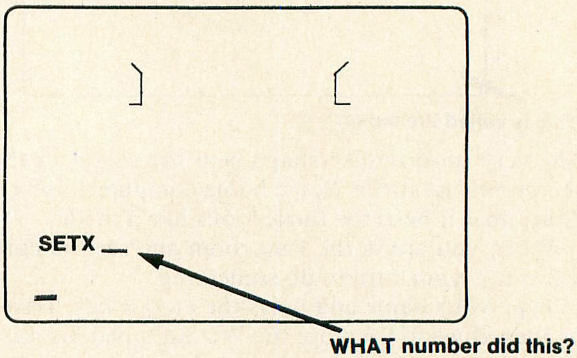
Use HT for HIDETURTLE
Use ST for SHOWTURTLE

Try it — use HT to make Telli disappear; ST to make Telli reappear.

Telli can jump through hyperspace to another place on the screen. Try some hyperspace jumps.

Type: SETX 20 and press ENTER.
Type: SETX 200 and press ENTER.

Experiment! Find a number that gives Telli a split personality, so the screen looks like this:



```
SETX __
```

WHAT number did this?

SETX makes Telli jump left or right. SETY makes Telli jump up or down. Try some SETY hyperspace jumps.

Type: SETY 160 and press ENTER.
Type: SETY 30 and press ENTER.

What numbers give Telli a split personality with SETY?

Here is a game for two or more people. One person hides Telli, then uses SETX and SETY to tell Telli to make a hyperspace jump to somewhere on the screen. Another player guesses where Telli is hiding and points to the place. Someone then types ST so Telli reappears. The player who pointed closest to where she reappears is the winner.

OK, here we go. We Type:

```
CLEAR
HT
SETX 120
SETY 160
```

Where is Telli? Point to the place, then someone type ST. Were you right on? Were you close? Your turn!

The Wordsworth Letters

We love the letters! Here are letters from families who play together, learn together — solving our Wordsworth challenges. The first letter is from Marcie Lauterbach and her son, Eric.

My 7-year-old son, Eric, and I would like to submit our answers to your Wordsworth contest as described in the August 1984 issue of RAINBOW *magazine.*

Q1) ABRACADABRA (52)
Q2) ABACK (66)
Q3) ZIOTY (1,755,000)
ZIPPY (1,497,600)
Q4) Eleven Letters: ABRACADABRA (15,552)

These answers are based on The American Heritage Dictionary, *paperback edition, published by Dell. I'm*

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not sure this is the same edition as described in your article. It was, however, the only one available in our area. Our answers may be judged accordingly.

Eric and I had a lot of fun doing this puzzle; he typed in most of both WW programs. We both looked up words. He would type them in as I spelled them. His 5-year-old brother, Jack, had fun typing in names of our family and pets, and getting a number value for them.

We have had our TRS-80 CoCo for about two months and all of us enjoy playing games, typing in programs and just fooling around on it.

I appreciate the format of your article being geared to the "younger users." It is also helpful and fun for us not-so-young beginners! Keep up the good work. I look forward to future articles.

Our next letter is from Margaret Mary Jones and three of her children.

Here are the answers to your contest:

1) ABRACADABRA
2) ABACK
3) YUMMY (2,218,125)
4) ABRACADABRA

I did this activity with three of my four children (ages 10, 7, 5). We enjoy your column very much — both the reviews and the programs.

I have a few comments on Peanut Butter Panic *which you reviewed a couple of months ago. First, you were wrong about the nutkins "eating" the stars. They catch them and put them in the star machine to make peanut butter sandwiches, which they do eat for energy. Second, the name probably refers to the panic that ensues when you have piled up six sandwiches and are unable to catch the snarf, and then have to eat all six sandwiches before the snarf gets one. Believe me, there is a panic in our house when that happens. We think it's a good name. Third, this game is one all three children can play. The 5-year-old is not as good as the 10-year-old, but he is able to manage to play the game correctly and can play with the 10-year-old.*

Next, let's hear from Stephen Lathom, who wrote his own letter. Good show, Stephen!

My name is Stephen Lathom. I am 8 years old going on 9. I used my family's 16K CoCo and my Webster's Beginning Dictionary *to answer your questions in the July issue of* THE RAINBOW. *My answers are listed below.*

1) ABRACADABRA 52
2) ABACK 66
3) WORRY 2,794,500
4) BABBLED 1,920

Thanks, everyone. We have more letters and will share them with you next time. Meanwhile, please send your answers to our Wordsworth challenges to Bob and Ramon, P.O. Box 310, Menlo Park, CA 94026.

Dragon Smoke

We have decided to publish a newsletter called "DragonSmoke" about four times a year. If you want a free copy, send a self-addressed, stamped envelope to DragonSmoke, P.O. Box 310, Menlo Park, CA 94026.

TCE News Release

MONDAY OCTOBER 1, 1984 *GAITHERSBURG, MARYLAND*

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String Functions:	CHR$, LEFT$, MID$, RIGHT$, LEN, INSTR, LSET, RSET, TRM$, STR$, STRING$, INKEY$, MKN$
Numeric Functions:	ABS, POS, TIMER, RND, ASC, TAB, CAL, JOYSTK, PEEK, POKE, LOC, LOF, EOF, FREE, CVN, ERR, VARPTR, SWAP
I/O Commands:	OPEN, CLOSE, INPUT, LINEINPUT, PRINT WRITE, PRINT @, GET, PUT, KILL, CHAINM, FIELD, DATA, READ, RESTORE
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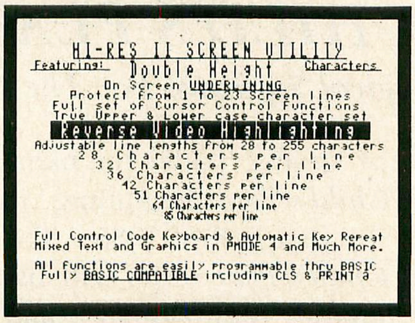

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Print @ on all line lengths	Yes	Yes	51 only
Different line lengths	28 to 255 (9)	28 to 255 (9)	51 only (1)
Automatic Key Repeat	Yes	Yes	Yes
Adjustable Key Repeat	Yes	No	No
Auto Repeat Disable	Yes	No	No
Erase to end of line/screen	Yes	Yes	Yes
Home Cursor	Yes	Yes	Yes
Solid or Blinking Cursor	Yes	No	Yes
CLS command supported	Buff/Black	Buff/Black	Buff/Black
X,Y Coordinate Cursor Positioning	Yes	Yes	No
Double Size Characters	Yes	Yes	No
Individual/Continuous Highlighting	Yes	Yes	No
On Screen Underlining	Yes	Yes	No
Clear Key functional	Clear/L keys	Clear key	No
16.32 & 64K Supported	Yes	Yes	Yes
Green or Black Background Color	Yes	No	No
Dual Character sets for Enhanced 64 and 85 Characters per line display	Yes	No	No
Protected Screen Lines (programmable)	1 to 23	No	No
Full Control Code Keyboard for Screen control directly from the keyboard	Yes	No	No
Programmable Tab Character Spacing	Yes	No	No
Full Screen Reverse Function	Yes	Yes	No
Switch to & from the Standard 16 by 32 Screen for full compatability	Yes	No	No
On Error Goto Function	No	No	Yes
Extended Basic Required	No	Yes	Yes
All Machine Language Program	Yes	Yes	Yes
RAM Required in addition to Screen RAM	2K	2K	2K
Program Price (Tape)	$24.95	$19.95	$29.95

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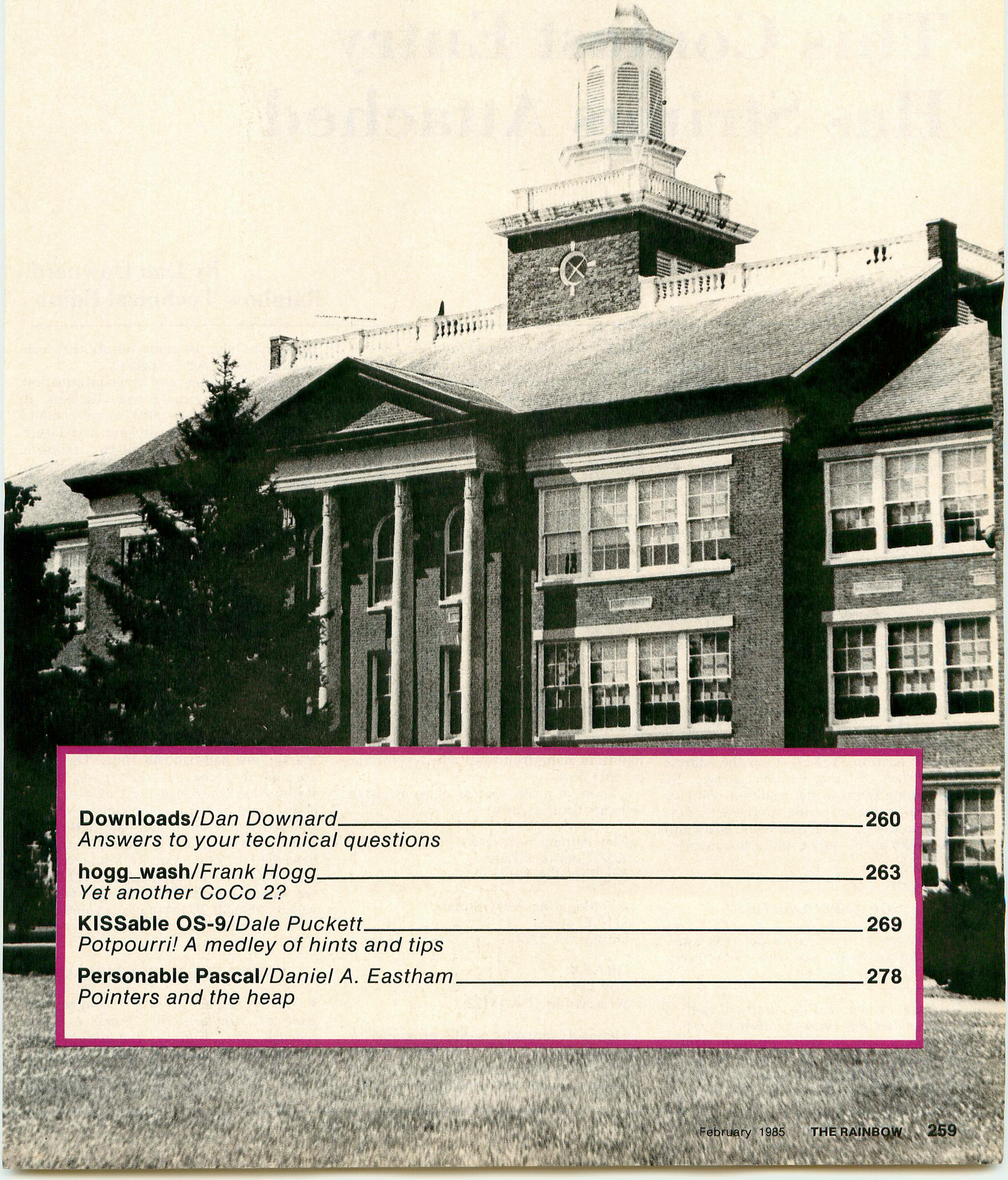

Downloads/*Dan Downard* ____ **260**
Answers to your technical questions

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Yet another CoCo 2?

KISSable OS-9/*Dale Puckett* ____ **269**
Potpourri! A medley of hints and tips

Personable Pascal/*Daniel A. Eastham* ____ **278**
Pointers and the heap

This Contest Entry Has Strings Attached

By Dan Downard
Rainbow Technical Editor

- *Is there a simple way to determine the number of bytes remaining in a cleared string space after string data has been loaded into that space? In the August '84* RAINBOW *on Page 111, Andy Kluck suggests using* EXEC 46481:FRE=FNPI(35)-FNPL(33) *but all I get is a UF Error. Am I doing something wrong?*

J.M. Stevens
Costa Mesa, CA

The reason you are getting a UF Error is because you are using the BASIC FN function without first defining the function. Let's see if we can't do the same thing another way. Use the following to find the free string space:

```
EXEC 46481: PRINT (PEEK(35) * 256
+ PEEK(36)) - (PEEK(33) * 256
+ PEEK(34))
```

EXEC464481 reorganizes the string space. The two bytes at memory location 35 ($27) are the address of the top of string space. Location 33 ($23) stores the address of the start of string variable storage. By subtracting the two, the resultant will give you the amount of string storage left. This program will be the "Downloads" entry into RAINBOW's One-liner Contest this month.

COCO SPECIALITIES

- *Your article in the November 1984 issue of* THE RAINBOW *was just what I have been looking for. I have heard the CoCo can be used for Morse code, slow-scan TV, RTTY, ASCII and facsimile, but have never seen it actually written (I have seen advertisements for Morse/RTTY interfaces).*

Unfortunately, your article did not give any specific information regarding equipment, etc. If you have a list of manufacturers of slow-scan, facsimile, etc., hardware and software interface products, I would greatly appreciate it, along with any bibliography you have of articles on this subject.

I hope this is not an unreasonable request because I have been looking high and low for information about how to use the CoCo for specialized communications.

Thank you for any help you can offer.

Richard A. Belz
Gainesville, FL

Richard, you are in luck this month. If you look around in this issue of RAINBOW, you will see an article on receiving weather facsimile transmissions on your CoCo by inputting audio from your receiver into the cassette port.

I know of a few sources of ham-related software for the CoCo:

Clay Abrams Software
1758 Comstock Lane
San Jose, CA 95124

A-5 Magazine, Mike Stone
1110 E. 4th St.
Durant, IA 52747

GRAFX
Box 254
West Mifflin, PA 15122

These software sources offer programs for the reception of CW, Slo-Scan, FAX, RTTY and ASCII. Some programs require interfacing hardware, others don't. Other companies have programs for utilities, such as electronic design or logging.

I will pass along any other information received in the near future, Richard. If enough interest is generated, we will compile a list of ham-related software in a future issue. I don't think this will be a problem though, since I received about two dozen letters similar to yours.

MORE K SURPRISE

- *I found I had a 64K machine after being told by Radio Shack I had a 32K upgrade.*

Why would Radio Shack put 64K chips in somebody's CoCo who asked for only 32K upgrade? I have the 1.0 ROM. I thought that wouldn't work with 64K? You have a good magazine. Keep on trucking.

Bob Hart, Jr.
Alton, IL

There never were any 32K chips on the market, just half-bad 64K chips. They were considerably cheaper than good chips. Radio Shack designed the CoCo so these chips could be used if necessary. I've only run across one set of half-bad (32K) chips and they were in a 'D' board CoCo. You need the 1.1 Color BASIC ROM to recognize your 64K, Bob. Try typing *EXEC41175* and see what happens. This will give you the version of BASIC ROM that is in your CoCo.

FOUND THE HAPPY MEDIAN

- *I have just spent days devouring my first issue of* THE RAINBOW. *When I finally reached your column, I couldn't resist noting that it's possible I know something that someone else doesn't.*

Mr. Noel P. Tomas, of Virginia Beach,

(Dan Downard is an electrical engineer and has been involved in electronics for 24 years through ham radio [K4KWT]. His interest in computers began about five years ago and he has built several 68XX systems.)

wrote with a problem regarding BWDUMP *being off-center. I had the same problem with Sugar Software's* CoCo Calligraphers *program. I was fortunate to have an angel of mercy who suggested I try elongation! He was correct! I simply enter* ?#-2,CHR$(27);CHR$(14) *prior to loading either program.*

Just for the record, I have the new 64K CoCo 2 and the DMP-110.

I do hope this helps!

Dolores Rosenthal
Los Angeles, CA

It's people like you, Dolores, who keep the rest of us informed. The only way to learn is by sharing your hints with others. Thanks for the tip.

WHICH DISK IS WHICH?

- *We have had our CoCo for a year and a half, and have upgraded to 64K and added a printer. We are now ready to take the big step to disk, but are a little confused. The obvious objective is to get the most capability from our limited resources. The RAINBOW carries numerous ads for disk drive systems from third party sources and there is an abundance of options available. Drives are available either SSDD or DSDD, with multiples of either type mounted in one case. Does a single DSDD drive give you "two drive" capability? What about controllers — Radio Shack or third party? Same with DOSs — Radio Shack or third party? Is Disk BASIC resident in the controller or do we have to get our CoCo upgraded yet again?*

Can you help with a little advice for a setup for home use? Thank you for a great magazine.

Mike Lotti
Centerville, VT

Mike, we receive on the average of one letter a day on the subject of which disk drive and controller to buy. While I won't tell you which to buy, I will give you some information to use in the decision making process.

There are several controllers on the market. The two most popular are the Radio Shack and the J&M. The J&M seems to be superior mechanically due to gold plated connectors, and electrically due to a different data separator circuit. A later generation controller chip allows it to work equally well with the CoCo or CoCo 2 since a 12-volt supply is not necessary.

At the same time, JDOS, the standard BASIC ROM supplied with the J&M controller, is not 100 percent compatible with Disk BASIC. Radio Shack has a copyright on Disk BASIC, and even though JDOS may be compatible from a BASIC standpoint, certain routines have different addresses causing problems for ROM calls. Disk formatting is also slightly different. At the same time, JDOS has some additional commands that are handy. One method of compatibility has been to use a J&M controller with a Disk BASIC ROM.

The bottom line of the situation, though, is that you get what you pay for, and there is absolutely nothing wrong with the Radio Shack disk controller.

The common drives that are available are 40- and 80-track, single or double-sided. Double density is standard, as single density is rarely used anymore. This question is the crux of the situation. Disk BASIC is designed to use a 35-track, single-sided, double-density (SSDD), disk drive. Actually, the drives Radio Shack is currently supplying are 40-track drives. You can still only use 35 tracks with Disk BASIC due to software limitations.

The whole idea of having a disk drive is storing programs and data. The more storage, the better off you are. A double-sided drive will store twice as much data as a single-sided drive. An 80-track drive will store twice as much data as a 40-track drive. The only catch is that double-sided (DSDD) disks are required for a double-sided drive.

Hence, we take another look at JDOS since you can use different disk formats. JDOS will allow use of more than 35 tracks for data. The price you pay is a non-Radio Shack disk format. You can transfer all of your programs to this format and have more storage on each disk.

The above discussion assumes you are using Disk BASIC. For advanced operating systems, such as FLEX, OS-9 and STAR-DOS, the drivers for these "non-standard" disk drives are either built in or easily modified for their use.

In any case, you must have one standard 35/40-track in the system as this is the standard format for CoCo software. The second drive can be anything you desire for data storage. For OS-9, the larger, the better. The only disadvantage of not having a standard second drive is the ability to make two-drive backups, which save a little bit of time by not having to swap disks as you do for a single drive copy.

I hope this helps you, Mike. For your information, I use a Radio Shack controller and two Radio Shack drives, but I have an 80-track double-sided drive that I use for OS-9 occasionally. I have BASIC 1.1, Extended Color BASIC 1.1 and Disk BASIC 1.0.

ONLY SEEING ONE SIDE OF THE STORY

- *I purchased a 4K CoCo. I could not get it to work on any of the 256 x 192* PMODE 4 *graphics. All I can get is 128 x 64.*

Anyone I talked with said I could not do it unless I had Extended BASIC, as well as 16K. So, I installed 16K myself; I had Radio Shack install Extended BASIC.

In the meantime, I had to clean contacts on the keyboard and, of course, the warranty is out. I still cannot get PMODE 4. *With programs of* PMODE 4, *I get a picture twice as wide as it should be. Only the left half of a picture, full screen, on a cold start, I get: Color BASIC 1.0.* EXEC 41175 *gives me 1.1 and* POKE 25,6:New ?MEM *yields* 14631 *and after* PMODE 0:PCLEAR1 ?MEM *gives* 13095. *This seems to be correct. But, still the same problem. Mine is the E Board and I have been a service tech on TV so I feel if I could find out what to do I am sure I could do any modification necessary.*

Am I the only one who has had this problem or have others? Can anyone help me? Thank you.

Maurice R. Reynolds
Bellflower, CA

Maurice, the problem you are having is not due to Extended BASIC, but how much memory it takes for *PMODE 4* graphics.

It is possible to display *PMODE 4* with Color BASIC. In fact, an entire chapter of the manual *Getting Started With Color BASIC*, starting on Page 252 is devoted to Hi-Res graphics.

Your problem is memory. *PMODE 4* graphics require 6K of screen memory. You are only seeing half of a page since that's all of the screen memory you have. It appears you have not changed the jumpers required for the 16K upgrade. Change these jumpers and you will be able to create the same graphics as the guys with Extended BASIC.

HUSH-HUSH HEX CODES

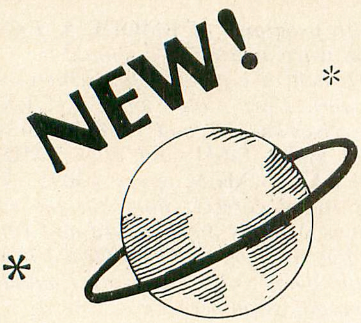
- *How do you read the Hex codes (eight each) that make up the 8 x 12 (5 x 7 characters) dot-matrix alphanumerics blocks that are stored in the VDG? I'd like to know. Thank you.*

F. Emil Stolarik
Cleveland, OH

Sorry, Emil, this is secret information. Actually, you can't read the codes since they are in a ROM that is part of the 6847 Video Display Generator (VDG) inside your CoCo. Depending on the graphics mode of the VDG, each byte of screen memory is converted to either an alphanumeric, or a graphics character by the VDG.

If you are interested in changing the characters, there are several screen enhancement packages available allowing custom character sets. If you are just interested in the dot-matrix patterns internal to the VDG, you will have to obtain a data sheet from Motorola on the 6847.

Your technical questions are welcomed. Please address them to: Downloads, THE RAINBOW, P.O. Box 385, Prospect, KY 40059. We reserve the right to publish only questions of general interest and to edit for space and clarity.



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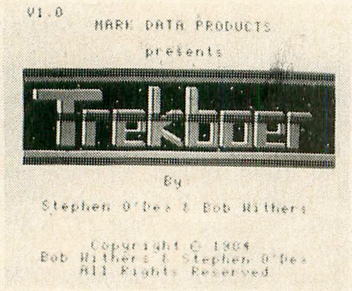

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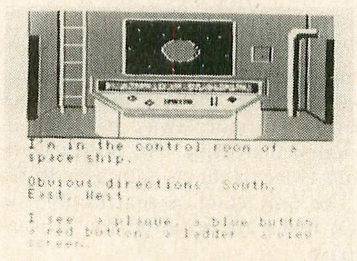

I'm in the control room of a space ship.

Obvious directions: South, East, West.

I see: a plaque, a blue button, a red button, a ladder, a view screen.

OK.

This exciting hi-res adventure begins aboard the starship TREKBOER in the 21st century. Life on Earth is threatened by a deadly virus and your mission is to search the frontiers of space and return with a cure to save mankind from disaster. But how? Where? The name of your starship provides the first clue.

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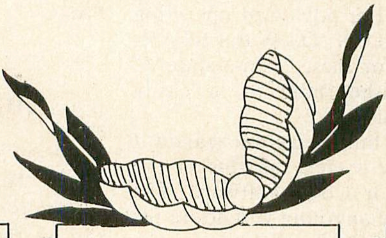
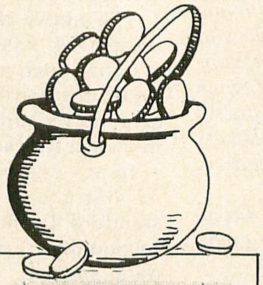
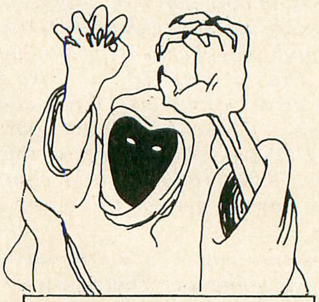
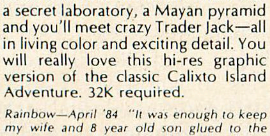








I'm in Professor Lagarto's comfortable study.

I see: a roll top desk, an oriental rug, an antique table, a flight of stairs.

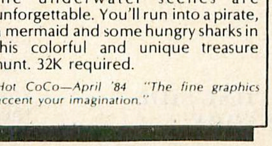
Welcome to the Calixto Island Adventure.

OK.

CALIXTO ISLAND

A valuable museum treasure has been stolen, can you recover it??? This is a challenging puzzle with an occasional twist of humor. You'll visit a secret laboratory, a Mayan pyramid and you'll meet crazy Trader Jack—all in living color and exciting detail. You will really love this hi-res graphic version of the classic Calixto Island Adventure. 32K required.

Rainbow—April '84 "It was enough to keep my wife and 8 year old son glued to the computer for an entire weekend and two week nights."



You are on a sandy beach.

Obvious directions: North, South, East, West.

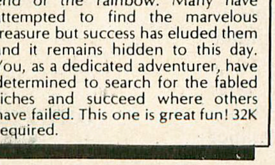
You see: a pirate, a boat, the ocean.

OK.

SEA SEARCH

Get your shark repellant and scuba tanks ready! The graphics in this adventure are truly outstanding and the underwater scenes are unforgettable. You'll run into a pirate, a mermaid and some hungry sharks in this colorful and unique treasure hunt. 32K required.

Hot CoCo—April '84 "The fine graphics accent your imagination."



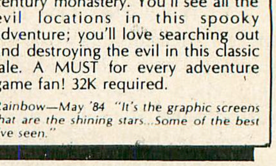
You are in a small efficiency apartment

You see: an old brass bed, a dresser, a wooden valet, a closed window, a door.

OK.

SHENANIGANS

Countless legends tell of a magnificent Pot of Gold hidden at the end of the rainbow. Many have attempted to find the marvelous treasure but success has eluded them and it remains hidden to this day. You, as a dedicated adventurer, have determined to search for the fabled riches and succeed where others have failed. This one is great fun! 32K required.



I'm in rugged mountain country. Snow is falling.

Obvious directions: North, South, West.

I see: pine trees, a cabin in the distance.

OK.

BLACK SANCTUM

Encounter the forces of black magic as you roam around an old 18th century monastery. You'll see all the evil locations in this spooky adventure; you'll love searching out and destroying the evil in this classic tale. A MUST for every adventure game fan! 32K required.

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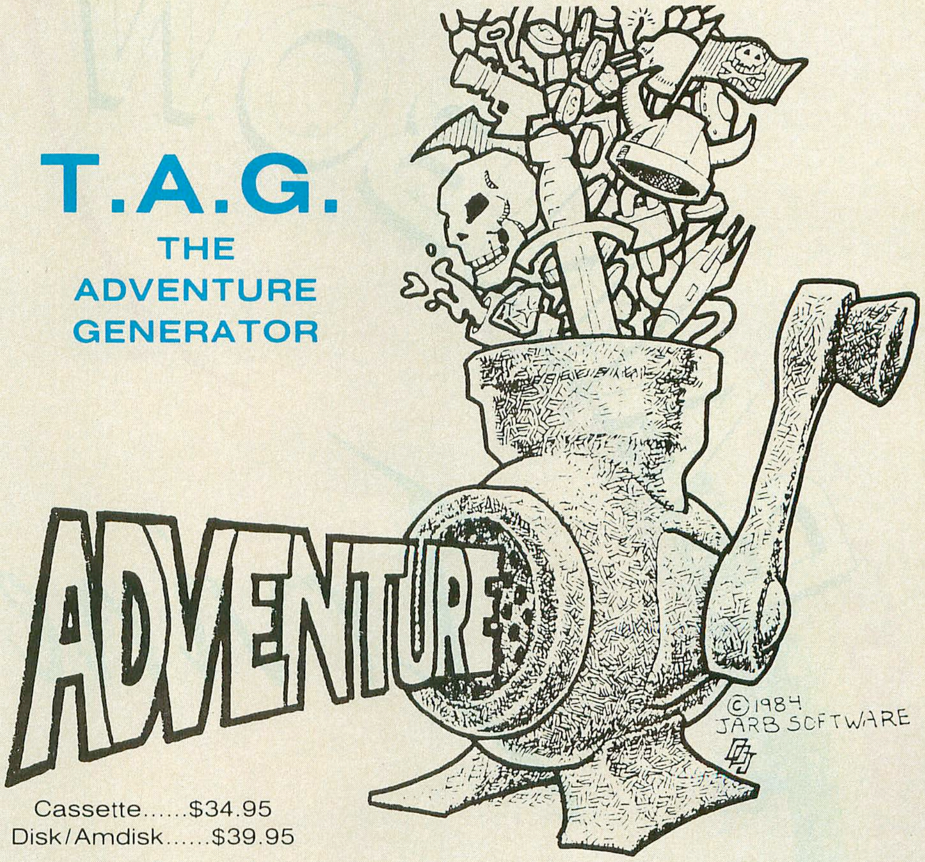

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Irvine

Feb. 15-17

Show Schedule:

Friday evening — Exhibit hall open from 7 p.m. to 10 p.m.

Saturday — Breakfast at 8 a.m. Exhibit Hall opens at 10 a.m. and closes at 6 p.m.

Sunday — Exhibit Hall open from 11 a.m. to 4 p.m.

Joining in the fun and excitement of **RAINBOWfest** is a great way to get to know the CoCo Community. Many of those who write for THE RAINBOW —and those who are written about — attend CoCo's very own show. It's a people-to-people event as well as a valuable learning experience.

For the 1984-85 season, we've scheduled three **RAINBOWfests** in three parts of the country. If you missed the **RAINBOWfest** in Princeton, N.J., why don't you make plans now to be with us in Irvine, Calif., or Chicago, Ill.? Each show will offer fun, excitement, new products, seminars and information for your CoCo! And for those who (perish the thought) don't like CoCo as much as you, we've scheduled each **RAINBOWfest** in an area that will provide fun and enjoyment for the whole family.

Our Irvine, California, show is being held at the Irvine Marriott Hotel, which offers special rates for **RAINBOWfest**. The show opens Friday evening with a 7 p.m. to 10 p.m. session. It's a daytime-only show Saturday — the CoCo Community Breakfast is at 8 a.m., then the exhibit hall opens promptly at 10 a.m. and runs continuously until 6 p.m. There will be no exhibition hours or seminars Saturday evening. On Sunday, the exhibit hall opens at 11 a.m. and closes at 4 p.m.

Our highly popular CoCo Community Breakfast will again feature a well-known figure from the Color Computer Community. And the exhibition will be interspaced with a number of seminar sessions on all aspects of CoCo — from writing in machine language to making your BASIC work better.

But most of all, there will be exhibitors. Lots of them. All ready to demonstrate products of every kind. Some with special programs and hardware items to introduce. Others with show specials.

Tickets can be secured directly from THE RAINBOW. We'll also send you a special reservation form so you can get your special room rate.

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RAINBOWfest Irvine

Seminar Program And Speakers

- **Linda Nielsen** — **The CoCo Artist**
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Linda, of Moreton Bay Laboratory, and several others active in the CoCo area, will demonstrate some graphics and help you to learn about some techniques you can use.

- **Dale Puckett** — **Beginner's Tour Of OS-9**
  Beginner's Tour Of BASIC09

A free-lance writer and programmer, Dale has worked with microprocessors since 1976, and is the author of *The Official BASIC09 Tour Guide*. Dale will be available to sign copies of his new book. *The Complete RAINBOW Guide to OS-9.*

- **Bob Albrecht** — **School Is In The Heart Of The Child**

Bob Albrecht, RAINBOW columnist who writes "School Is In The Heart Of The Child," is one of the most prolific authors in the microcomputer world today. A specialist in writing for beginners, he is the author of numerous books, including *TRS-80 Color BASIC.*

- **Jim Reed** — **Writing For RAINBOW**

Jim, managing editor of THE RAINBOW, will talk about how you can submit programs and articles to magazines for fun and profit. He is also senior editor of PCM — and editorial director of SOFT SECTOR (for the Sanyo).

- **Bill Nolan**
- **Bob Albrecht** — **GameMaster's Apprentice And Dragon's Byte**

Bill Nolan, who teaches "Programming In BASIC" at the college level, owns Prickly-Pear Software Co. and has written several commercially successful software packages.

- **Dan Downard** — **Inside Your Color Computer**
  Software And Hardware Interfacing

Dan Downard is the technical editor for THE RAINBOW and an electrical engineer. He has been involved in electronics for 24 years through ham radio (K4KWT). His interest in computers began about five years ago and he has built several 68XX systems.

- **Don Inman**
- **Tim Finger**
- **Bob Albrecht**
  Along with several other panelists — **A Realizable Fantasy: The Home Dream Machine**

Don Inman is a co-author of a series of booklets for Radio Shack titled *Color LOGO Guide for Teachers*. He is a former teacher and is presently a full-time author with the DYMAX group.

Tim Finger is a member of the DYMAX group, along with Don and Bob.

- **Wayne Day** — **Exploring CompuServe and the Color SIG**
  The CoCo User and the Local Bulletin Board

Wayne Day, a traffic engineering signal technician, is the SYSOP of The Color SIG of CompuServe, the world's largest consumer information service. He is also a certified paramedic and works part-time for an Emergency Medical Service provider. His amateur radio operator call sign is WA5WDB.

- **Radio Shack** — **CoCo Classroom**

Sharpen your programming skills and learn about LOGO. Introduce your computer illiterate friends to the wonderful world of CoCo. Classes will be conducted by trained Radio Shack instructors during show hours on Friday, Saturday and Sunday.

- **Ken Kaplan,** president of Microware Systems Corp., will be our keynote speaker at the CoCo Community Breakfast, Saturday morning at 8 a.m.

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can backspace over characters to edit them. Also, command repeat has been added. The key will auto-repeat if you hold it down for a second.

The final feature is that the keyboard is table driven. This means you can redefine any non-alpha key to be anything you want. This also supports the full matrix so keyboards with the extra four keys, like HJL's, can be used. You can either make the changes in the table or in the source, the choice is yours.

We encourage keyboard vendors to provide suggestions for their customers on the use of their keyboards with XEX. If you will send this information to us, we will include it with XEX when we ship it out.

Screen

The screen driver and all the font files are provided in source, also. The major feature here is that the fonts are in separate modules and are therefore very easy to change. You can also create your own fonts and use them. If you create some and send them in, we will include them with the package.

Another feature is sideways scroll. With this, we hope to make *DynaStar* work with text wider than the screen. Another group is working on that. There are other features here that were in CC FLEX, so I won't repeat them.

Disk Driver

The disk drivers are also provided in source. They support all types of disks, 35-, 40- and 80-track single- and double-sided and double density. The drivers are also able to double step, which means you can read a 40-track disk with an 80-track drive. Each drive can have separate stepping speeds from 30 ms to 6 ms. These drivers are a little faster than those in CC FLEX, but otherwise are the same.

We did make one minor change in that the default format for Track 0 is now double density instead of single. This means that XEX format disks cannot be read by other FLEX systems. You can make a standard FLEX disk on XEX, and that is what you would do to transfer information between systems. XEX will read and write standard FLEX disks with no problem. The reason we did this was to provide more room on the disk. With double-sided disks, you get 16 sectors more than standard FLEX. No big deal, but 16 sectors is 4K more storage and it might make the difference some day. This feature is an option, anyway; you can do it either way you choose.

Startup Routine

The startup routine is also provided in source. This is the routine that asks for the date and executes the startup file. If you have a clock board in your system, this routine would be modified to get the date from the board. You can also modify this routine to set up the system the way you like it. Because this routine resides in memory that is reused by the system, you can do just about anything you like without making the system itself bigger. Third party vendors like PBJ will replace this routine with their own for their clock boards.

> ***"Another feature is sideways scroll. With this, we hope to make* DynaStar *work with text wider than the screen."***

Utilities

Many of the utilities are provided in source form. This is useful both for modification and education reasons. The entire list that will be provided was not complete at the writing of this article, but it includes the disk formatting program and the utilities for using an external terminal, the various printer drivers and the programs that support the 128K options. We plan to provide everything we can. The only reason we would leave something out would be if the code was proprietary or not in a condition to be seen. As time goes by, we will add more source to the package. Updates will be available for $5 per disk plus shipping. The system comes on three disks.

The Manual

We have redone the manual. It now comes in a D-ring easel binder and in loose-leaf form. CC FLEX came in book form, and it is difficult to add pages to the manual for future versions and options. With the D-ring binder, it is easy to keep your manual updated. XEX also includes ED/ASM and DBASIC, which makes the manual twice as large as CC FLEX.

The Package

When you get it, all you need to do is run the main system disk. It is *not* protected, nor is any of the system. The other disks are the source and modules. You only need to bother with them if you want to modify the system. The modules are provided in source and binary, so if you modify one of them, all you need to do is assemble it and append a new system with the modified module. Full instructions are provided on how to do this.

Technical Assistance

We provide assistance by mail and by phone. However, like most companies, we cannot guarantee that someone who can help you will be there when you call. For that reason, it is better to do it by mail. You should limit your questions to two or three. We get some letters with 20 questions, and the response to that kind of letter has to wait many days or weeks until all the questions have been answered. If you limit your questions, you will receive an answer more quickly.

Upgrades

XEX is a new implementation of FLEX for the CoCo. In order to do it, we incurred the same costs that we did when we first did CC FLEX two years ago. Also, XEX has considerably more in it than CC FLEX has. For these reasons, we are not providing an upgrade to XEX from CC FLEX. We are offering a discount of 15 percent off what you paid for CC FLEX if you purchased it after Oct. 1, 1984, and before Feb. 1, 1985. All others will have to pay full price. We will still offer CC FLEX, but if you buy it after Feb. 1, 1985, there will be no discount.

We will be shipping XEX the first part of February 1985.

On the Catty Side

I found a new use for Nomad the robot. I got a new kitten that was driving me nuts! It wanted to play and play and then play some more. I tied a stick with a string on it to Nomad and programmed it to move randomly around. I sat back and just laughed, as I watched the kitten's antics!

KISSable OS-9

Potpourri! A Medley of Hints And Tips

By Dale L. Puckett
Rainbow Contributing Editor

One of the things I enjoy most about writing this column is the opportunity to see the ingenuity of Color Computer OS-9 enthusiasts. We'll share some of this creativity with you this month and try to answer a few of your questions. A few listings will round out the column.

Our first tip and the one that will grab a lot of attention comes from John E. Carter, WB4HLZ, of Smyrna, Ga. Since most people have three initials and the standard OS-9 prompt has three characters, John reasoned that he could find a way to personalize the OS-9 prompt. His procedure, *chgprompt*, will do the job. Use it by typing:

```
OS9: debug <chgprompt
```

The command line above assumes you have saved *chgprompt* in your current data directory. Do that using the OS-9 BUILD utility command or your favorite editor now. Here's the listing.

```
l shell
. .+36
=4A
=45
=43
q
```

After you run the command line above you will see the following prompt on your Color Computer screen.

```
JEC:
```

Of course, I forced OS-9 on my Color Computer to prompt me with "DLP: Do your thing!"

Later, I tried John's trick on the GIMIX. It worked. The prompt string of the Level II SHELL was at the same exact offset as the Level I SHELL that runs on the Color Computer.

Here's another trick John sent in. If you have been using OS-9 for awhile, you know you can use the DISPLAY utility command *to do many* things. For example, you can clear your Color Computer screen by typing:

```
OS9: display C ENTER
```

Or, you can send a form feed to your printer by typing:

```
OS9: display C >/p ENTER
```

And, since you can send more than one character with the DISPLAY command, you may send complex cursor commands to your screen or make your printer sing and dance. But, if you're like me, you can never remember the codes needed to do the job, and it's a major hassle to look them up in the "OS-9 Commands" manual or some appendix to your printer's users manual. For example, on my Epson MX-80 printer, I can switch into the Italics mode by displaying a two-byte string.

```
OS9: display 1B 34 >/p ENTER
```

Since it's much easier to remember the word "Italic," John rightly suggests that we place the command line above in an OS-9 procedure file named "Italic." Then, as long as that file is in our working data directory we may tell

---

(Dale L. Puckett is a free-lance writer and programmer who has worked with the Motorola family of microprocessors since 1976. Dale has written two books on OS-9: The Official BASIC09 Tour Guide, *published by Microware and* The Complete Rainbow Guide to OS-9, *published by Rainbow Bookshelf. He is the author of* DynaSpell, Readtest, Esther *and* Help, *all from Frank Hogg Laboratories. Dale serves on the Info World Software Review Board and is a Chief Warrant Officer in the U.S. Coast Guard.)*

our printer to switch into its Italic mode by typing:

```
OS9: italic ENTER
```

The command line above that sends the form feed to your printer could be put in a procedure file named FF. That would be easy to type. If you like to make your printer impress the neighbors, get out the manual and turn your imagination loose on some OS-9 procedure files.

John also sent in a short procedure file that prints a simple graphics display on your Color Computer. Try John's demo, then create your own. Have fun!

```
load display
display 80 80 80 80 80 80 80 80 80 80 80 80 80 80 80 80 80 80 80 80
80 80 80 80 80 80 80 80 80 80 80 80
display ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff
ff ff ff ff ff ff ff
display 20 6f 73 39 20 4f 53 39 20 6f 73 39 20 4f 53 39 20 6f 73 39
20 4f 53 39 20 6f 73 39 20 4f 53 39
display 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
20 20 20 20 20 20 20 20 20 20 20 20 20
display ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff
ff ff ff ff ff ff ff
display 80 80 80 80 80 80 80 80 80 80 80 80 80 80 80 80 80 80 80
80 80 80 80 80 80 80 80 80 80 80 80 80
unlink display
```

We were sorry to receive the last issue of Dick Dundon's *68XX(X)* newsletter earlier this week. Dundon had served the Color Computer and SS-50 family in the Evergreen State for several years with a quality newsletter. He was especially bullish about OS-9 and passed on a number of OS-9 tips to eager readers. We personally appreciated the nice things he said about *DynaSpell* and *The Official BASIC09 Tour Guide*.

Dundon's newsletter will be missed by everyone in Washington state that was lucky enough to subscribe. However, his writing talents won't be wasted. He started editing *MOTD*, the OS-9 users group newsletter in November and it was the best issue yet.

Speaking of *MOTD*, kudos to Jim Schmidt, who wrote a tremendous story about a conversation between several Radio Shack computers at a computer center after hours. His "CoCo Advocate" column will soon be required reading for all users group members. Tim Grovac also made a nice contribution to the new *MOTD* with an excellent BASIC09 tutorial. Keep up the good work.

After recovering from three weeks of temporary duty in San Francisco following the explosion and sinking of the tanker vessel Puerto Rican, and a month of burnout that hit after we completed *The Complete Rainbow Guide To OS-9*, we finally got a chance to check into the OS-9 SIG on CompuServe again. We picked up a couple of hints we thought we should share.

The concept of having a current execution directory and a current data directory is one of the most powerful features of OS-9. Besides, it saves a lot of typing. But, sometimes we get in trouble because we try to execute a program that isn't stored in our current execution directory. The infamous Error #216 message hits the screen.

Here's a novel way to beat the system. It was suggested by Greg Law. Remember though, if you don't follow this same procedure with all your disks, you could get in trouble using this technique. Every time you make a new system disk — or any disk that will hold an execution directory — follow these steps.

```
OS9: format /d1 ENTER
OS9: cobbler /d1 ENTER
OS9: makdir /d1/CMDS ENTER
```

Can you figure out the trick? During operation, OS-9 doesn't search for your current execution directory by name. It looks at the particular sector on your disk that it learned when you last ran the CHX command. If you run the sequence of commands above each time, you make a new disk; the CMDS directory will always be in the same location on each disk. Thus, once OS-9 has set itself up to use /d0/CMDS as the execution directory on one disk, it will find /d0/CMDS on all disks initialized the same way.

Here's another trick I was reminded of when I visited the OS-9 SIG. Study the /d0/SYS/password file on my system.

```
,,0,150,.,.,shell
dale,coastie,0,128,/d0/cmds,.,shell
esther,tripp,1,128,/d0/cmds,.,ds
michele,tiffy,2,128,/d0/cmds,.,shell
```

Everything here is standard except the third line. What do you think happens if Esther signs on with TSMON? You guessed it! She never sees the "OS9:" prompt. LOGIN takes her directly to the *DynaStar* text editor and lets her go to work.

During the long discussion that took place, David L. Kindred offered a suggestion that takes the process one step further. He showed how to let each user come online using his/her own "startup" file.

To do this, put the following entry in the last position of a user's password file.

```
shell startup ; shell
```

This entry will call a SHELL to process a file called "startup." That file will be located in the user's current data directory. In the password file above that would be the current data directory when LOGIN was called. However, it doesn't need to be. A pathlist to any directory could be typed in the entry position held by the period. Give it a try!

Just before we were called to San Francisco, Richard Don at GIMIX called us with hot news from the Windy City. GIMIX is now shipping UniFLEX for its 6809 GMX III computers. Don also told us that Bob Phillips, GIMIX president, visited Technical Systems Consultants (TSC) and that he was presently designing a 68010 CPU to work with the virtual memory version of UniFLEX 68000.

Don said the new card will run on GIMIX S-50 bus computers using existing intelligent I/O cards. He said that BASIC, COBOL, FORTRAN and a C compiler with bit fields already runs under UniFLEX, and noted that up to 15 users can each use up to four megabytes of virtual memory. The 68010 virtual memory systems reportedly run five times faster than present 6809 systems.

Speaking of upgrades, I received word from Tandy in Fort Worth recently that OS-9 *Version 01.01.00* had been released. Unfortunately, when I arrived at the Radio Shack Computer Store in Springfield, Va., they were already out of the $14.95 upgrade. The new version contains an enhanced screen that lets you clear to the end of a line, clear to the end of the screen as well as change the background color of your screen. It also supports the Radio Shack RS-232 pack at Baud rates as high as 9600.

A new version of OS-9 for the Color Computer is good news. However, I have been told by several readers that a few of the old bugs are still in the release. I am told you will find that the most important non-change is in the Baud rate tables for the Printer and RS-232 modules.

That's the bad news. The good news is the tables are the same. Only the offset from the beginning of the modules has changed. This means you can correct them with DEBUG. In the new PRINTER module the offset is now $65. In the new RS-232, the offset is $72. Use the following procedure file to do the job.

```
* make changes to allow 9600 Baud rate for printer

  l printer
  . .+65
  =04
  =82
  =01
  =a2
  =00
  =cd
  =00
  =63
  =00
  =2d
  =00
  =13
  =00
  =05
  l printer
  . .+a5
  =12
  =c6
  =00
  =59
  =58
  l printer
  . .+b3
  =f2
  * Make changes to allow /t1 to work at 9600 Baud
  l rs232
  . .+72
  =04
  =82
  =01
  =a2
  =00
  =cd
  =00
  =63
  =00
  =2d
  =00
  =13
  =00
  =05
  l rs232
  . .+b2
  =12
  =c6
  =00
  =59
  =58
  l rs232
  . .+ba
  =f2
  q
```

Save the procedure above in a file named *Baud_changes* and then make the changes with the following command line.

```
OS9: debug <baud_changes
```

As before, the file *Baud_changes* must be located in your current data directory.

K. J. Johnson of Brechin, Ontario, posed a problem. "For fun, you might poll your readers to submit how they resolved with the SHELL or BASIC09, the simple command frequently used in Radio Shack BASIC — *Print Hex$(30)* ENTER. Here's one solution using BASIC09:

```
PRINT USING "H2",30
```

Johnson wanted a filter that would indent the front of each line before printing. We'll try to put together a quick and dirty BASIC09 filter soon.

We have some TANO Dragon users out there. Kent D. Meyers wrote to say he could be reached at any of the following BBS numbers: 312-286-9015, 405-728-7654, 612-433-5194, 512-285-5028. You may also write him at Box 266, Le Roy, MN 55951.

And finally, we close this edition of KISSable OS-9 with two more listings from Tim Harris, a brand new programmer at Microware. *CRYPT* is an assembly language program that shows you how to encrypt and decrypt a file for security purposes. "*F.C*" shows you how to write a simple text formatter you can use to print and number text files.

Enjoy! And if you live on the West Coast, we hope to see you at RAINBOWfest in Irvine, February 15-17.

Listing 1:

```
          CRYPT: AN ASSEMBLY LANGUAGE ENCRYPTION FILTER

* crypt utility : crypts files for user protection
* 6809 Assembly Language
* for Color Computer OS-9  v. 01.00.00
* (c) 6/17/84 by Tim Harris
*
* Uses std. input and output so it acts as a filter
* Sample calls:
*      crypt keyword <infile >codedfile
*      crypt keyword <codedfile          prints file to screen
*      list infile ! crypt keyword >outfile
*      crypt keyword <infile ! crypt keyword  will print out file
*
*
         nam crypt
         use /d0/DEFS/OS9Defs
*
* Data Area
EOF      equ 211
MAXKEY   equ 15
         org 0
OUTCHAR  rmb 1
KEYLEN   rmb 1
CHAR     rmb 1
KEYBUF   rmb MAXKEY
         rmb 200 stack area
CRPMEM   equ .
* Program Area
         mod CRPEND,CRPNAM,PRGRM+OBJCT,REENT+1,CRPENT,CRPMEM
CRPNAM   fcs "crypt"
CRPENT   clrb clear the counter
```

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```
             leay KEYBUF,u get the key value
CRP10        lda ,x+
             cmpa #$0D are you done?
             beq CRP15 yes, go on with program
             cmpa #$20 maybe, check again?
             beq CRP15 yes, go on
             sta ,y+ no, store the char
             incb incriment the counter
             bra CRP10 go back for more
CRP15        stb KEYLEN save the key length
CRP20        ldb KEYLEN get key length
             leay KEYBUF,u point to start of key
CRP25        pshs y,b
             clra
             ldy #$1
             leax CHAR,u
             os9 I$Readln
             bcs CRP30
             puls b,y
             lda CHAR get the char
             eora ,y+ crypt it
             sta CHAR store it for output
             pshs y,b
             lda #$1
             ldy #$1
             leax CHAR,u
             os9 I$Writln
             bcs CRP30
             puls b,y
             decb are you done?
             bne CRP25 no, crypt more
             bra CRP20 yes, get more of the file
CRP30        cmpb #EOF is it at EOF?
             bne CRP35 no, exit with error
             clrb yes, clear error status
CRP35        os9 F$Exit exit the program
             emod
CRPEND       equ *
             END
```

Listing 2:

```
                    "F.C": A SIMPLE TEXT FORMATTING UTILITY

/* f utility:  optional formatter for DynaStar */
/* formats with tm=6; bm=60; pl=66; lm=8       */
/* has optional page numbering (use -n)        */
/* has no problems with double spacing         */
/* sends to stdout so use redirection for /p   */

/* CoCo OS-9     C-Compiler 01.00.00           */
/* (c) 6/6/84    by: Tim Harris                */
/* Call:                                       */
/*     f <-n><filename> (> redirection)        */

#include <stdio.h>
#define MAXLINE 80
#define PAGLEN 54

main(argc,argv)
int argc;
char *argv[];

     FILE *fp,*fopen();
     int linenum=1, number=0, pageno=1;
     char line[MAXLINE];

     if (argc>3  argc==1)
          error ("f: improper arguments",NULL);
     if (argc ==2)
          if ((fp=fopen(argv[1],"r"))==NULL)
               error ("f: can't open %s",argv[1]);

     else
          if (argv[1][0]=='-' && argv[1][1]=='n')
               number=1;
          else
               error ("f: illegal option %c",argv[1][1]);
          if ((fp=fopen(argv[2],"r"))== NULL)
               error ("f: can't open %s",argv[2]);

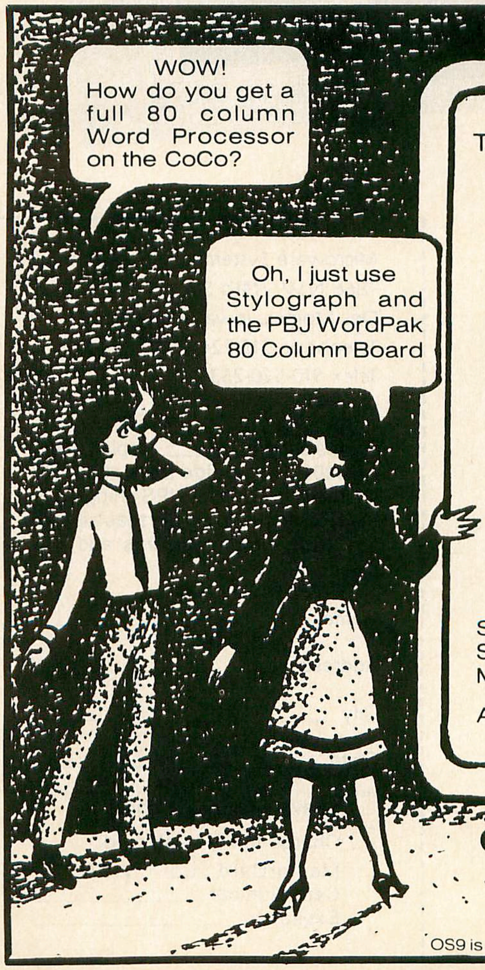
     printf("\n\n\n\n\n\n");
     while (fgets(line,MAXLINE,fp)!=NULL)
          printf("        %s",line);
          ++linenum;
          if (linenum>PAGLEN)
               linenum=1;
               printf("\n\n\n");
               if (number)
                    printf("                                       %d\n\n\n\n\n\n\n\n\n",pageno++);
               else
                    printf("\n\n\n\n\n\n\n\n\n");


     while (linenum <= PAGLEN)
          ++linenum;
          printf("\n");

     printf("\n\n\n");
     if (number)
          printf("                                        %d\n\n\n",pageno++);
     else
          printf("\n\n\n");
     fclose(fp);


error(s1,s2)
char *s1,*s2;

     printf(s1,s2);
     printf("/n");
     exit(1);
```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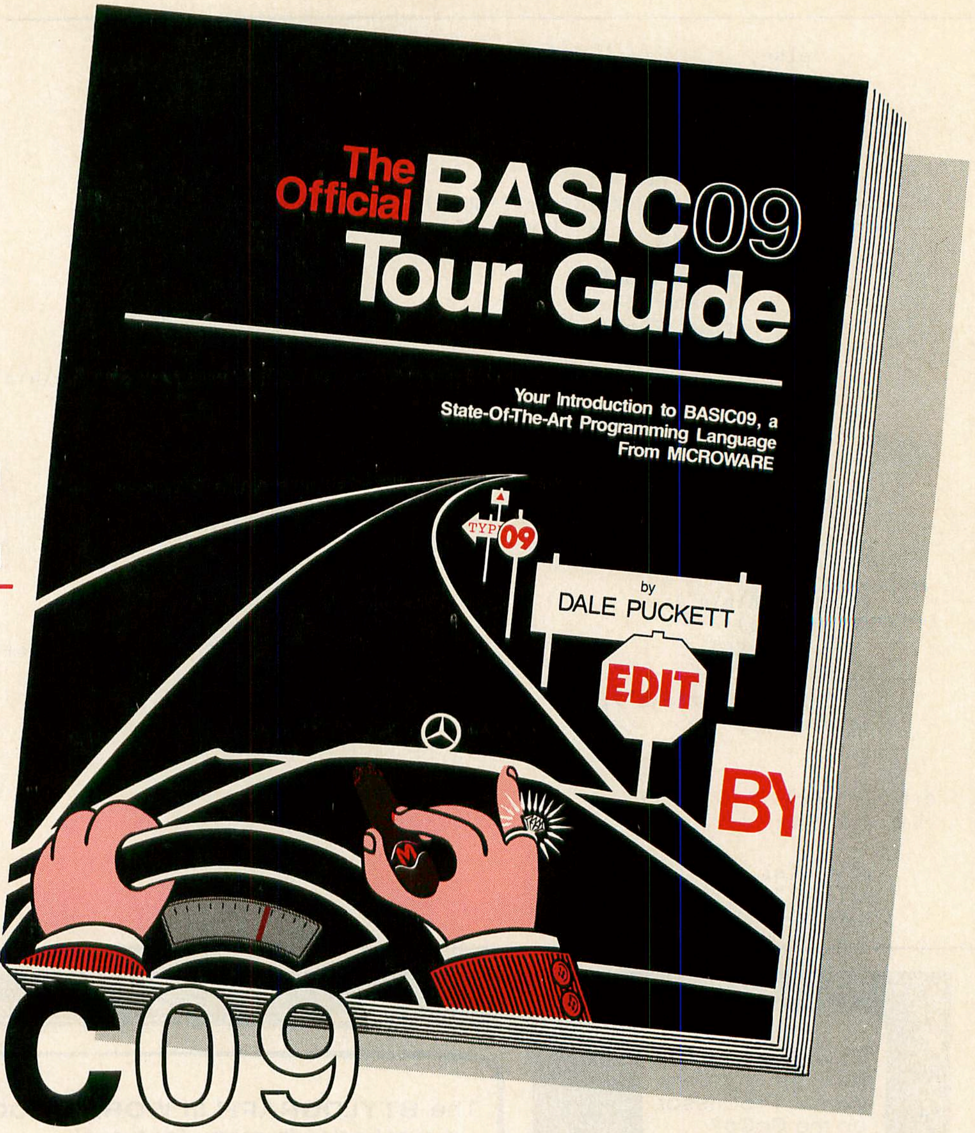
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OS-9 UTILITY

Tidy Up Listings With LISTFILE

By Gerry Schechter

If you do any programming at all, you already know it can be very helpful to have a hard copy listing available in order to assist in debugging and modifying programs. When using Extended BASIC, a simple *LLIST* will provide the desired listing. In BASIC09, a *LIST procname >/p* will also do the job.

In either case, however, there are no top and bottom page margins, so you wind up printing on the perforations of the paper, which is kind of sloppy. If you ever break up your listings, punch holes in them and file them away as I do, then you know this can be a problem. Even if you don't, wouldn't it be nice to have a neatly formatted listing?

(Gerry Schechter has over 12 years of data processing experience. He is currently employed by Mercy College where he is the manager of technical services. Writing software for the Color Computer is one of his hobbies.)

Since I like to have things simplified, I came up with a program called *LISTFILE.* This program, which is written in BASIC09, will produce a neatly formatted listing of any OS-9 file that would normally be *LISTable*. Although it is designed with BASIC09 programs in mind, it can also be used with most other OS-9 files as well, with no problem.

Aside from skipping over the perforations, it will also print out today's date, the filename in elongated printer mode, and a page number at the top of every page for better readability and documentation. For BASIC09 programs, the listing is indented five spaces on each line that does not have a line number, in a manner similar to that of BASIC09's *LIST* command.

Using this program could not be easier. When it prompts you for the filename to be listed, all you have to do is to enter its name. This name must follow the OS-9 pathname conventions, so if the file to be listed is in your current data directory, all you need to do is to enter the filename. If it is not, you must enter the full pathname.

When your file has been listed, you will again be prompted for a filename to be listed. If you have no more files to be listed, just hit ENTER, and the program will end by itself.

The only part of this program you might have to modify has to do with putting your printer into the elongated print mode. As written, it is designed for the Radio Shack Line Printer VIII. Between lines 120 and 130 (not every line in mubered in BASIC09, you will find the necessary comments to help you in modifying the program to suit your particular printer.

I hope you will find this program useful, and that it will encourage you to write your own utility programs when the need arises. For those of you who don't like typing in programs, I would be happy to send you a copy of my program for $1, if you will send a blank disk and a SASE to: 75 Midland Terrace, Yonkers, NY 10704.

The listing:

```
PROCEDURE LISTFILE
(* ------------------ *)
(* LIST FILE UTILITY  *)
(* GERRY SCHECHTER    *)
(* 75 MIDLAND TERRACE *)
(* YONKERS, NY 10704  *)
(* V1.1 - APRIL 1984  *)
(* ------------------ *)
PRINT CHR$(12)
PRINT "     ** LIST FILE UTILITY **"
ON ERROR GOTO 130
DIM XX:INTEGER
DIM KEY:STRING[1]
DIM FILENAME:STRING[24]
DIM FIRSTTIME,BASIC:BOOLEAN
DIM INDATA,TEMP:STRING[128]
DIM LINECOUNT,PAGECOUNT:BYTE
DIM DISK,PRINTER,POINTER:BYTE
100 FIRSTTIME=TRUE
PRINT
PRINT " ENTER FILE NAME TO BE LISTED:"
INPUT " ",FILENAME
IF LEN(FILENAME)=0 THEN
PRINT
```

```
PRINT " PROCEDURE CONCLUDED."
PRINT
END
ENDIF
OPEN #DISK,FILENAME:READ
PRINT
INPUT " LINE UP PAPER AND HIT ENTER..",KEY
PRINT
OPEN #PRINTER,"/P":WRITE
110 READ #DISK,INDATA
IF FIRSTTIME THEN
GOSUB 120
FIRSTTIME=FALSE
IF LEFT$(INDATA,9)="PROCEDURE" THEN
BASIC=TRUE
ELSE
BASIC=FALSE
ENDIF
ENDIF
IF BASIC THEN
IF LEFT$(INDATA,9)="PROCEDURE" THEN
INDATA="***   "+INDATA
ELSE
IF LEFT$(INDATA,1)>"9" OR LEFT$(INDATA,1)="(" THEN
INDATA="       "+INDATA
ELSE
POINTER=SUBSTR(" ",INDATA)
TEMP=LEFT$(INDATA,POINTER)+"      "
INDATA=LEFT$(TEMP,5)+RIGHT$(INDATA,LEN(INDATA)-POINTER)
ENDIF
ENDIF
ENDIF
IF LINECOUNT>60 THEN
GOSUB 120
ENDIF
PRINT #PRINTER,INDATA
IF EOF(#DISK) THEN
CLOSE #DISK
CLOSE #PRINTER
GOTO 100
ENDIF
LINECOUNT=LINECOUNT+1
GOTO 110
120 IF NOT(FIRSTTIME) THEN
FOR XX=1 TO 5
PRINT #PRINTER
NEXT XX
ELSE
PAGECOUNT=1
ENDIF
PRINT #PRINTER,LEFT$(DATE$,8);
(* START ELONGATION FOR LP VIII *)
PRINT #PRINTER,CHR$(27); CHR$(14);
PRINT #PRINTER,TAB((50-LEN(FILENAME))/2); FILENAME;
(* END ELONGATION FOR LP VIII *)
PRINT #PRINTER,CHR$(27); CHR$(15);
PRINT #PRINTER,TAB(50); "PAGE NO: "; PAGECOUNT
PRINT #PRINTER
LINECOUNT=2
PAGECOUNT=PAGECOUNT+1
RETURN
130 ERRNO=ERR
PRINT
IF ERRNO=215 OR ERRNO=216 THEN
PRINT " FILE NOT FOUND!"
GOTO 100
ELSE
PRINT " ERROR # "; ERRNO; " ENCOUNTERED!"
ENDIF
PRINT
PRINT " PROCEDURE TERMINATED"
PRINT " DUE TO ABOVE ERROR."
PRINT
END
```

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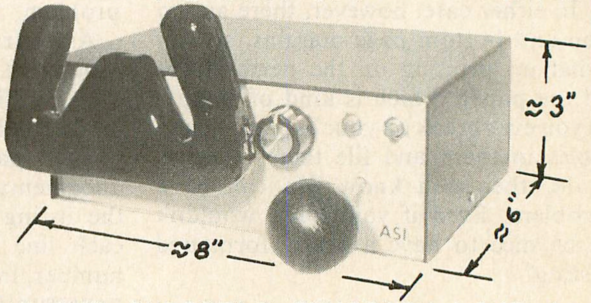

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PERSONABLE PASCAL

Pointers And The Heap

By Daniel Adams Eastham
Rainbow Contributing Editor

Have you ever written a program where you were dealing with a collection of data items, but really didn't want to put a limit on the number of items you could handle? In BASIC, you would probably use an array and make the *DIM* statement declare as many elements as would fit in memory. But, what if you needed two such arrays? How big do you make each one?

This problem occurs because of the way BASIC allocates memory for data; you either use one of the legal two character names as a simple variable or array, or declare an array with a *DIM* statement. The memory is allocated when the interpreter encounters the name and all subsequent references to that name refer to that particular area of memory.

(Daniel Eastham holds a B.S. in computer science and has 13 years experience in systems and communications programming including work on the original Telenet packet switching network. He is the author of the DEFT Pascal Workbench *and is currently president of Deft Systems, Inc.)*

Automatic Allocation

The normal mechanism for allocating data memory in PASCAL is only a little different. In this case, when the block in which a variable is declared is activated, memory for the variable is allocated, then all references to that variable in that activation of the block reference the same area of memory.

The major difference occurs if the block recursively activates itself, then a second allocation of the variable is made. As each activation is terminated, memory for the variable for that activation is released and becomes available for use by other variables.

Last month's calculator program used this technique to allocate memory for intermediate expression values depending on the number of levels of parentheses nesting. Each time a left parenthesis was encountered, the function *Expression* would be activated allocating another memory area for *TermAmount*. Each time a right parenthesis was encountered, the function would return, releasing its memory.

Pointers

But what if you want to allocate many copies of a variable without having to call a procedure or function? Answer: you use *pointers*. A pointer is a special kind of type in PASCAL which has as its value the memory location of a variable. For example:

```
VAR P : ^Real;
```

This statement allocates a variable 'P' which is a pointer to a real number. Memory for the pointer 'P' is automatically allocated; memory for the real number to which 'P' points is not allocated.

Dynamic Allocation

In order to allocate memory for the real number, you have to use the built-in procedure NEW. For example:

```
NEW (P);
```

When this procedure is invoked, memory for a real number is allocated from an area of memory called the *heap*. The address of this allocated memory is placed in the variable 'P'. This memory area can then be accessed as a real variable by *dereferencing* the pointer variable. For example:

```
P^ := 15.3E2;
A := A * (P^ + 3.2);
```

In this example, the constant *15.3E2* is placed in the real number pointed to by 'P'. Then, in the second statement this value is used in an expression that modifies the variable 'A'. By suffixing the pointer variable name with an up-arrow, you indicate that you want to use or modify the variable the pointer is referencing (or pointing to), rather than the pointer itself.

In addition to dereferencing, pointers can be compared for equality, used as parameters in procedures and functions, and assigned. Some examples of these operations are shown further on.

Pointers to Pointers

This still doesn't solve our "as many as you want" problem since the pointer variable itself is allocated automatically. In order to completely solve the problem, we will also have to dynamically allocate the pointer variable. Our first inclination is to create a pointer to 'P' as follows:

```
TYPE PType : ^Real;
VAR Q       : ^PType;
  .
  .
  .
NEW (Q);
NEW (Q^);
Q^^ := 3.15E2;
```

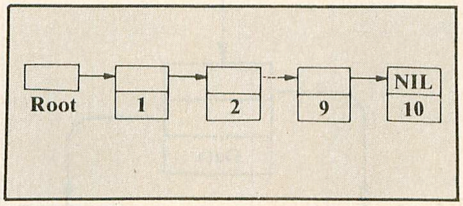
Where *PType* is a type which is a pointer to a real, and 'Q' is a variable which is a pointer to *PType*. The first NEW allocates a pointer to a real and puts the address of the pointer in 'Q'. The second NEW allocates the real number and puts its value in the pointer allocated by the first NEW. The assignment statement sets the value of the real number.

Linked Lists

Although this is legal PASCAL, it really isn't what we want. We need to allocate a pointer variable at the same time we allocate a real so we always have a "free" pointer variable to use to allocate another real. What we need is a *Node*:

```
TYPE Node = RECORD
        P : ^Node;
        R : Real;
    END;
VAR Q : ^Node;
```

Now, when we allocate memory, we are allocating both a pointer and a real number. The way this works is that each Node contains a value (R) and a pointer to the next Node (P). We are going to create a structure that looks like this:

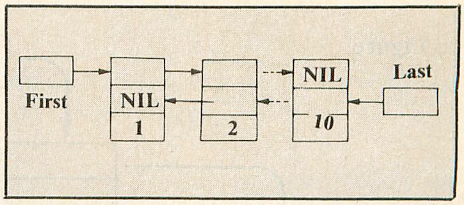


Where Root is a pointer variable that points to the first Node. NIL is a built-in pointer type constant that indicates the pointer is not pointing to any memory location. A structure of this type is called a *linked list*. The following program creates this list:

```
PROGRAM LinkedList;
TYPE Node = RECORD
        P : ^Node;
        R : Real;
    END;
VAR Q, Root : ^Node;
    I : Integer;
BEGIN
  Root := NIL;
  FOR I := 10 DOWNTO 1 DO BEGIN
    NEW (Q);
    Q^.R := I;
    Q^.P := Root;
    Root := Q;
    END;
END.
```

The program starts by initializing Root to the NIL value and then executing a *FOR* loop. On each iteration of the loop, the program allocates a Node, inserts a value, points it to the last allocated Node and then saves the address of this last Node in Root. We need two pointer variables since we need to be able to reference the last Node while allocating the next one.

You can see from the example that the Nodes end up in the reverse order from the one in which they were allocated. To make them come out in the same order, we can either use another pointer variable (since we now have to keep track of the first one, the most recently allocated as well as the next one) or a *doubly-linked list*. A doubly-linked version of this structure looks like this:



Now each Node points to each of its neighbors instead of just the next one. The following program will build this list:

```
PROGRAM Double;
TYPE Node = RECORD
        P1, P2 : ^Node;
        R : Real;
    END;
VAR First, Last, Q : ^Node;
    I : Integer;
BEGIN
  Last := NIL;
FOR I := 1 TO 10 DO BEGIN
  NEW (Q);
  IF Last = NIL THEN First := Q
    ELSE Last^.P1 := Q;
  Q^.P1 := NIL;
  Q^.P2 := Last;
  Q^.R := I;
  Last := Q;
  END;
END.
```

With doubly-linked lists it is much easier to add or delete nodes in the middle of the list. For example, a procedure to delete a node from the above list would be:

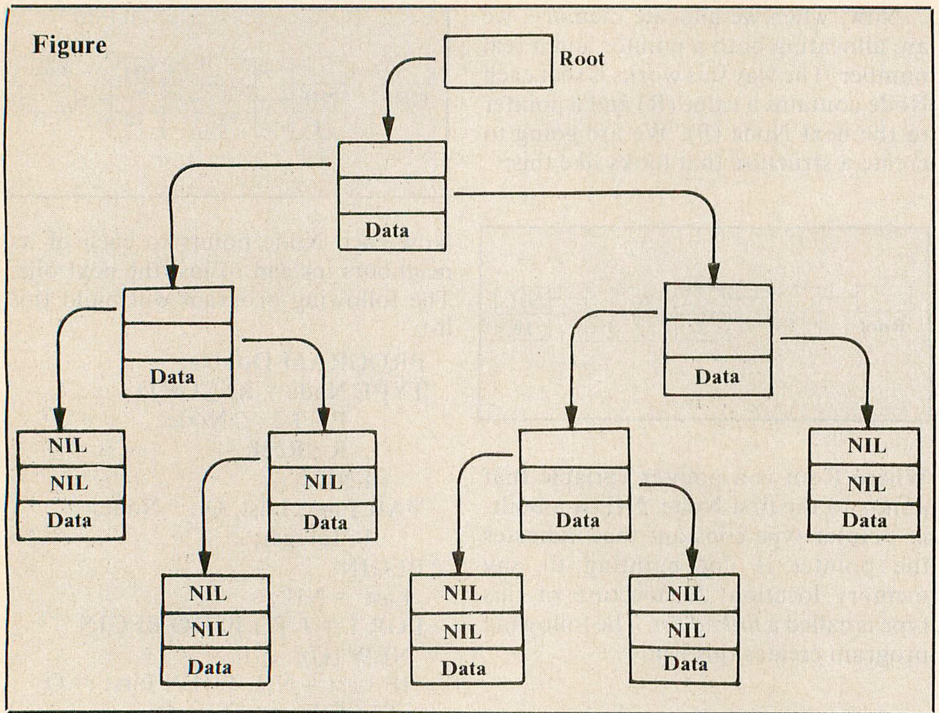
```
TYPE NodePtr = ^Node;
  .
  .
  .
PROCEDURE DeleteNode (Q :
    NodePtr);
BEGIN
  IF Q^.P1 <> NIL THEN Q^.P1^
    .P2 := Q^.P2;
  IF Q^.P2 <> NIL THEN Q^
    .P2^.P1 := Q^.P1;
END;
```

This puts the backward pointer into the backward pointer of the next node, and the forward pointer into the forward pointer of the last node. This results in the next node pointing to the previous one and vice versa.

Binary Trees

This month's example program uses a *binary tree* to sort a list of records. This is a group of nodes arranged in the following type of structure:

Figure



It is in the form of an inverted tree with each node having up to two branches. Pointers are used to denote branches off of each node. This type of structure is usually used to place and maintain data in a particular order.

We are going to use this structure to sort a list of records into ascending order. We will use the following rules to build the tree:

1) Each node will contain one data record.
2) The first pointer (Smaller) will point to the branch of nodes which contain data records which are all less than this data record.
3) The second pointer (Larger) will point to the branch of nodes which contain data records which are all greater than or equal to this data record.

Since every node will follow these rules, you could find the data record with the smallest value by following the chain of Smaller pointers down the left side of the above picture. The largest value will be at the end of the Larger pointers on the right side of the picture. In fact, going from left to right, you can see that the data values will be in ascending order.

Example Program

The question, of course, is how to get them into this structure. Looking at the program listing we can see that the procedure *AddNode* is used to build the tree. By taking advantage of PASCAL's recursive abilities, the routine is very simple. It is called from the main program with the address of the top node in the tree (the main program puts the address of the first data record in Root).

AddNode first checks to see whether the data in Current is less than or greater than the data in Branch. If it is less and there is no Smaller branch, then Current gets added to Branch directly. If there is a Smaller branch, then *AddNode* calls itself with Smaller in order to add it to the appropriate node on that branch. If the data in Current is greater than or equal to that in Branch, then the same operation is performed using the Larger branch.

AddNode will continue to call itself until it finds an "empty" branch (one with a NIL pointer) to attach Current to. This whole process then gets repeated for each record in the file.

Once all the records have been read in and the tree built, the routine *WriteNode* is used to write all the records back out in order. *WriteNode* is called from the main program with the top node in the tree. It first checks to see if it has been called with a NIL pointer. If not, it calls itself to write out all the data which is in its Smaller branch, then it writes out the data that is in Branch. It then calls itself again in order to write out the data that is in its Larger branch. In effect, *WriteNode* is merely following the three rules that we originally listed above.

This binary tree technique for sorting records is a very efficient means of sorting data that is randomly distributed. This is because many short branches will be constructed. However, if the incoming data is primarily in sequence or exactly out of sequence, then the tree will be very lopsided and the sort will take much longer.

Special Notes

At the beginning of the program you can see that *NodePtr* is declared as a pointer to the type Node. However, at this point in the program, Node is not known. PASCAL allows pointers to forward reference a type declaration so that you can declare types which point to themselves.

The built-in functions *MEMAVAIL* and *SIZEOF* provide the ability to determine whether there is sufficient memory left to allocate another Node. *MEMAVAIL* returns the number of bytes of memory remaining in the heap. *SIZEOF* returns the number of bytes of memory that a particular type or variable uses.

We did not discuss the two routines used in *DEFT Pascal* to return a memory area to the heap. These are *MARK* and *RELEASE*. You call the *MARK* routine at a point in your program just before you start allocating memory that you will later want to release. After you have allocated all the memory you need and are finished using it, you call *RELEASE* with the same pointer value that *MARK* returned in order to release the memory back to the heap. For example:

```
VAR Save : ^Integer;
 ...

MARK (Save);  (* save heap state in
                                Save *)
NEW ( ...);
 ...     (* allocate and use memory *)

RELEASE (Save);  (* heap restored
                     to point of MARK *)
```

The pointer you use with *MARK* and *RELEASE* can be pointers to any type.

If you have any questions about the use of pointers or the heap in PASCAL, you can call (301) 253-1300 during normal business hours for help. Next month we will learn about the separate compilation facilities in *DEFT Pascal*. (If you have a disk system, these commands are needed prior to loading:)

```
PCLEAR 1
FILES 0,0
CLEAR 16,4999
```

The listing:

```
00 0000   (***************************************************
00 0000   *
00 0000   *  This program uses a binary tree to
00 0000   *  sort records as they are read in from a file.
00 0000   *  It then writes the sorted records out to
00 0000   *  another file.
00 0000   *
00 0000   *  When the program prompts you for INPUT FILE:
00 0000   *  enter the name of the file that contains the
00 0000   *  data to be sorted.  The program will read and
00 0000   *  sort the records, print the total read and
00 0000   *  prompt you for OUTPUT FILE:.  Enter the name
00 0000   *  of the file that the sorted records are to be
00 0000   *  written to.
00 0000   *
00 0000   ***************************************************)
00 0000
00 0000   PROGRAM BinarySort (Input, Output);
00 0000
00 0000   CONST  RecordSize = 80;
00 0000
00 0000   TYPE  NodePtr = ^Node;
00 0000         Node = RECORD
00 0000                  Smaller : NodePtr;
00 0000                  Larger  : NodePtr;
00 0000                  Data    : String (RecordSize);
00 0000                END;
00 0000
00 0000   VAR   Root, Current : NodePtr;
00 0000         Filename : String;
00 0000         DataFile : Text;
00 0000         RecordCount : Integer;
00 0000   (***************************************************
00 0000   *
00 0000   *  Recursive routine to Add a Node to the tree
00 0000   *
00 0000   ***************************************************)
00 0000
00 0000   PROCEDURE AddNode (Branch : NodePtr);
10 0003
10 0003   BEGIN
11 0007     IF Current^.Data < Branch^.Data THEN BEGIN
12 0020       IF Branch^.Smaller <> NIL THEN AddNode (Branch^.Smaller)
12 003E       ELSE Branch^.Smaller := Current;
12 005D       END
11 005D     ELSE BEGIN
12 0060       IF Branch^.Larger <> NIL THEN AddNode (Branch^.Larger)
12 007E       ELSE Branch^.Larger := Current;
12 00A0       END;
11 00A0   END;
00 00A4
00 00A4   (***************************************************
00 00A4   *
00 00A4   *  Recursive routine to write the nodes back out
00 00A4   *
00 00A4   ***************************************************)
00 00A4
00 00A4   PROCEDURE WriteNode (Branch : NodePtr);
10 00A4
10 00A4   BEGIN
11 00A8     IF Branch <> NIL THEN BEGIN
12 00BC       WriteNode (Branch^.Smaller);
12 00CC       WRITELN (DataFile, Branch^.Data);
12 00E6       RecordCount := RecordCount + 1;
12 00F7       WriteNode (Branch^.Larger);
12 0107       END;
11 0107   END;
00 010B   (***************************************************
00 010B   *
00 010B   *  Main entry for BinarySort
00 010B   *
00 010B   ***************************************************)
00 010B
00 010B   BEGIN
01 0113     Page;
01 011F     WRITELN;
01 0127     WRITELN ('BINARY SORT PROGRAM');
01 014C     WRITELN;
01 0154     WRITE ('INPUT FILE: ');
01 0171     READLN (FileName);
01 0186     RESET (DataFile, FileName);
01 019B
01 019B     Root := NIL;
01 019F     RecordCount := 0;
01 01A5     WHILE (MEMAVAIL > SIZEOF (Node)) AND
01 01BA           NOT EOF (DataFile) DO BEGIN
02 01DF       NEW (Current);
02 01EB       Current^.Smaller := NIL;
02 01FB       Current^.Larger := NIL;
02 020D       READLN (DataFile, Current^.Data);
02 0226       IF Root = NIL THEN Root := Current
02 023A                     ELSE AddNode (Root);
02 024C       RecordCount := RecordCount + 1;
02 025B       END;
01 025E
01 025E     IF NOT EOF (DataFile) THEN WRITELN ('OUT OF MEMORY');
01 029B     WRITELN (RecordCount, ' RECORDS READ');
01 02C8     WRITELN;
01 02D0
01 02D0     WRITE ('OUTPUT FILE: ');
01 02EE     READLN (FileName);
01 0303     REWRITE (DataFile, FileName);
01 0318     RecordCount := 0;
01 031E     WriteNode (Root);
01 0329     CLOSE (DataFile);
01 0336     WRITELN (RecordCount, ' RECORDS WRITTEN');
01 0366   END.
```

CORRECTIONS

"Cooking With CoCo" (December 1984, Page 155): Two numbers were reversed in the paragraph beginning with "Mount the SN7404 . . .." The corrected sentences read: ". . . connect pins 1, 3, 5, 7, 9 and 11 together and also to pin 1 of the 40-pin socket. Connect pin 14 to pin 20 of the 40-pin socket." Also, in later models of the CoCo (NC board and CoCo 2) the circuit board is "piggybacked" over the MC6821 PIA chip; the second "PIA" is actually an MC6822 IIA chip in these machines (or in older computers with Radio Shack's upgraded keyboard installed).

"Creating Moire Patterns in PMODE 4" (October 1984, Page 19): Larry Taylor suggests that a problem he had in the "Bouncing Line" program (Listing 3) can be fixed by inserting this line:

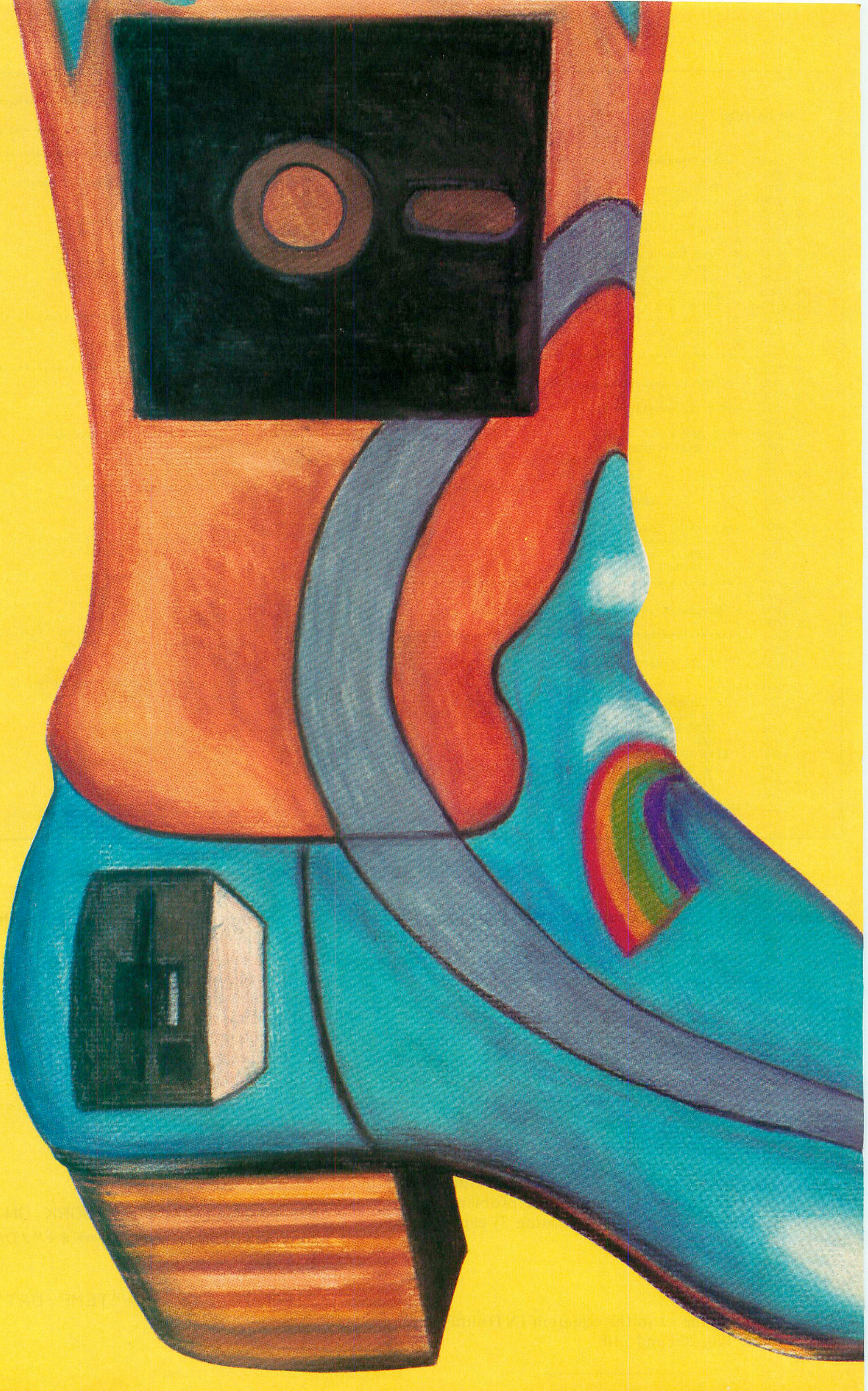
```
115 GOTO 160
```

and by removing the –1 in the equation INT(number/Q)–1 in lines 160, 170, 200 and 210.

"Developing A Database Manager" (December 1984, Page 256): Bill Nolan tells us that there have been problems with FN Errors (filename) occurring when a file is sorted twice. The reason is that the extension (/DAT) is added well after the start of the program; if a file is sorted twice, the extension is added a second time and you end up with something like "SAMPLE/DAT/DAT," which causes the error. To fix it, he suggests changing lines 40 and 2100 to the following.

```
40 PRINT:PRINT " WORK ON WHICH F
ILE?":INPUT F$:F$=F$+"/DAT":GOSU
B 5500:CLOSE #1

2100 T$=F$:TT$="TEMP/DAT"
```



OS-9 UTILITY

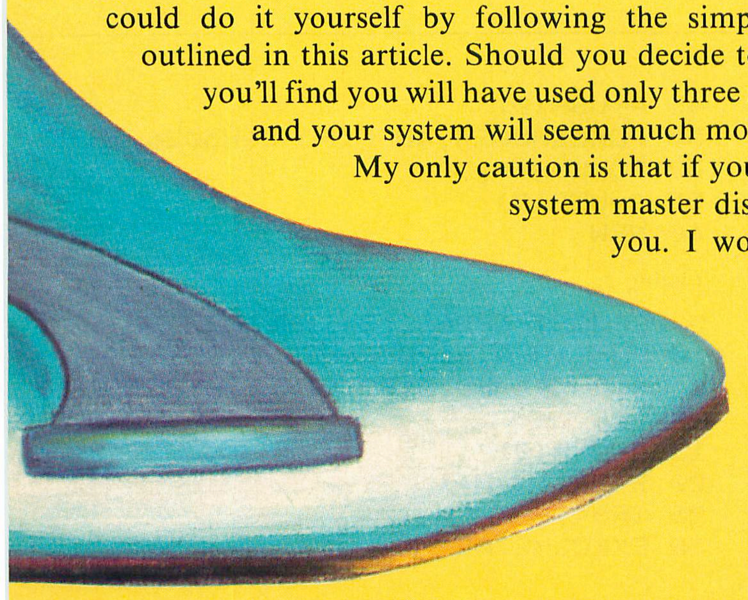
Get A 'Boot' Out Of OS-9

By Charles Robitaille

Have you recently purchased OS-9 from Radio Shack and found that its system master disk wasn't directly bootable? Do you wish it was? Then read on! The reason you can't directly boot to your system disk is because you have Version 1.0 Disk BASIC ROM, instead of the newer Version 1.1. The newer version has the boot routine built into it and if you had this ROM you would only have to insert the system master disk, type DOS, and be on your way.

There are, fortunately, several ways around this. You could, for one, upgrade to the newer ROM, which isn't exactly cheap. You could wait for Radio Shack to send you a version upgrade patch and hope it includes direct booting. Or, you could do it yourself by following the simple procedure outlined in this article. Should you decide to do it yourself, you'll find you will have used only three sectors of disk space, and your system will seem much more professional.

My only caution is that if you have modified your original system master disk, then this procedure might not work for you. I would further add that this original system master



(Charles Robitaille is a service engineer for CGR Corporation. He maintains complex medical imaging equipment, his specialty being CT scanners. Charles has a wife and two children and enjoys spy novels.)

disk should never be modified, except under instructions from Radio Shack, or you could lose compatibility with other users.

We will be working with a backup of the OS-9 system master disk, so if you haven't already done so, write-protect your original system master disk, Version 01.00.00. This is to protect it from being written to inadvertently. If you're not familiar with how to make a backup, I suggest you study Chapter 4 of the *Getting Started with OS-9* manual.

Once the backup is made, put away your original system master disk until it is specifically asked for. When your backup is made, leave it in drive 0 and delete two files from it. The files are named *LIST* and *OS9GEN*. They are occupying the three sectors we will need for our boot program. Don't worry, though, because the last thing we will do is copy these files back from the original. At that time, they'll occupy different sectors, but will operate just fine. By the way, to delete these files all you need to type at the OS9: prompt is:

```
DEL /D0/CMDS/LIST
DEL /D0/CMDS/OS9GEN
```

After this is done, we will need to write a couple of short BASIC programs, one of them being the *BOOT* program itself. So, power down your system and power it back up again to get under control of Disk BASIC. Your backup system master disk should be in drive 0. Type in Listing 1 and then *RUN* it.

This program will set up Track 17, Sector 2 as Disk BASIC's granule allocation table. By doing this, we have told Disk BASIC that the only granule left to write to begins at Track 16, Sector 1, which is where we want our *BOOT* program to reside. It will then set up Track 17, Sector 3 to accept a directory entry.

The last thing it does is set up Track 0, Sector 2, which is OS-9's cluster allocation table. We will have, in effect, told OS-9 that it cannot use the above mentioned sectors because they are already in use. This program not only makes it possible to run the *BOOT* program, but it also protects the *BOOT* program from an inadvertent *SAVE* when under Disk BASIC, while also protecting it from OS-9 writing over it.

The next step in this procedure is the most pleasurable, because when we are done, we will have a bootable OS-9 system master disk. Type in Listing 2, which is the *BOOT* program. With the backup disk still in drive 0, type the following:

```
SAVE"BOOT"
```

You now have a bootable OS-9 system master disk. But, don't throw away your OS-9 Boot disk because it contains your drive speed test program which you will want to run from time to time. We must now get back the two files we deleted earlier. To get back into OS-9 simply type:

```
RUN"BOOT"
```

Insert your original write-protected system master disk and copy these two files to the bootable backup disk we just made. At the OS9: prompt, you'll need to type:

```
COPY /D0/CMDS/LIST /D0/
CMDS/LIST -S #16K

COPY /D0/CMDS/OS9GEN /D0/
CMDS/OS9GEN -S #16K
```

That's all there is to it. If you choose, you can make a backup of this disk, although it's not really necessary since if you somehow "bombed" it out, you could easily make another. By the way, the drive speed test program is named *CHR$(130)+CHR$(129)+".BIN"*. So, if you wanted to rename this program to *SPDTST.BIN*, for example, you would type under Disk BASIC:

```
RENAME CHR$(130)+CHR$(129)+
".BIN" TO "SPDTST.BIN"
```

The program will be a lot easier to call up and send to another disk should you choose to use your OS-9 Boot disk for something else.

OS-9 is one of the most powerful operating systems in the world for a microcomputer. It may very well be the most powerful of all, so to all of you who have become part of the OS-9 network, I say congratulations. You have done your homework well and spent your money wisely. Learn OS-9 and master it, and if this little boot program will help you enjoy OS-9 more, then your time will have been well spent.

Listing 1:

```
5 DEFUSR0=&HD66C:POKE&HEA,3:POKE
&HEB,0:POKE&HEC,17:POKE&HED,2:PO
KE&HEE,&H50:POKE&HEF,0
10 FORI=&H5000 TO &H5100:POKEI,&
HC9:NEXTI
15 POKE&H5020,&HFF
20 A=USR(0)
25 FORI=&H5000 TO &H5100:POKEI,&
HFF:NEXTI
30 POKE&HED,3
35 A=USR(0)
40 POKE&HEA,2:POKE&HEC,0:POKE&HE
D,2
45 A=USR(0)
50 POKE&H5024,&HFF:POKE&H5026,&H
D9:POKE&HEA,3
55 A=USR(0)
60 NEW
```

Listing 2:

```
5 DEFUSR0=&HD66C:S=1:H=&H27
10 POKE&HEA,2:POKE&HEB,0:POKE&HE
C,34:POKE&HED,S:POKE&HEE,H:POKE&
HEF,0
15 A=USR(0)
20 S=S+1:H=H+1
25 IFS<19 THEN 10
30 EXEC&H270C
```

OS-9 SOFTWARE WITH X-TRA POWER

XTERM

XTERM is a full featured OS-9 communications program that takes full advantage of the power of OS-9. It works with the normal text screen, XSCREEN, or the Wordpak 80 column board.

XTERM is menu oriented for ease of use, it is simple to use even for the novice OS-9 user. And yet, XTERM is powerful enough for the expert OS-9 user.

Some of the features of XTERM include: full upload and download support with remote buffer operation; supports XON/XOFF protocol; 110/300/600/1200 baud, 5/6/7/8 bits, even/odd/no parity, full or half duplex; able to execute an OS-9 shell command from within XTERM.

XTERM works with a Color Computer using the standard serial interface, but also will work with a hardware serial port. Also, if you are using a hardware parallel printer port, you can print data to the printer as it is received.

XTERM $59.95

XMENU

XMENU is a system that creates a menu-driven environment for the Color Computer using OS-9. OS-9 now becomes easy-to-use with command selections made from menus. Menus are included to access OS-9 commands. An easy-to-use utility is provided that allows for the creation and maintenance of menus.

XMENU works with XSCREEN, the normal text screen, O-PAK, and the WORDPAK 80-column board.

XMENU $39.95 **NEW**

XWORD

XWORD is a powerful word processing system for the Color Computer using OS-9. XWORD is feature packed with only a few features mentioned here.

Some of the editing features of XWORD include: true character oriented full screen editor; works with the normal text screen, XSCREEN, O-PAK, or WORDPAK 80 column card; full block commands with blocks displayed in inverse characters (except with normal text screen) for easy block manipulation; file size not limited to a buffer size; full find and replace commands with wildcard character; able to execute an OS-9 shell command in the middle of editing. Many, many more features, too many to mention here.

Some of the formatting features of *XWORD* include: proportional spacing supported; perfectly aligned hanging indents and columns, even when using proportional characters; full printer control with control of character size, emphasized, italics, overstrike, underlining (with or without spaces), super and sub-scripts; up to 10 header/footers; page numbering in decimal or Roman numerals; margins and headers can be set differently for even and odd pages; automatically reads printer initialization file to define XWORD for your printer (many included, and easy to write or modify your own). Many more features.

XWORD $79.95

XSCREEN

XSCREEN creates a high resolution screen for the Color Computer using OS-9. This high resolution screen gives you 24 lines of text with 51, 64, or 85 characters per line. Characters can be either white on a black background or vice versa. Easy menu operation.

XSCREEN $19.95

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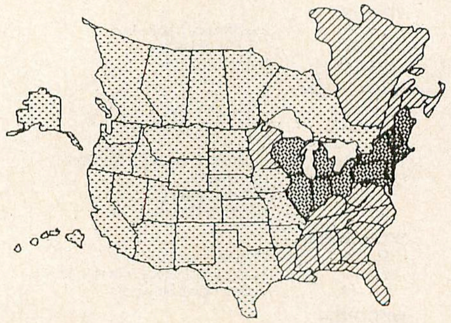

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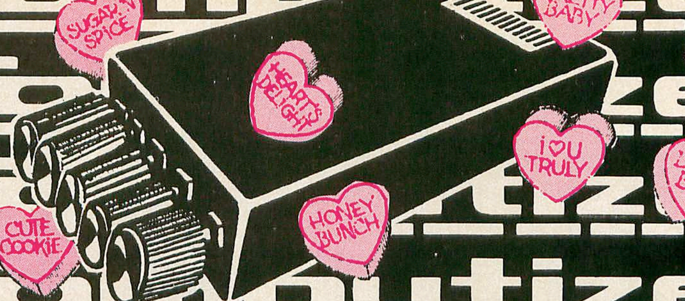
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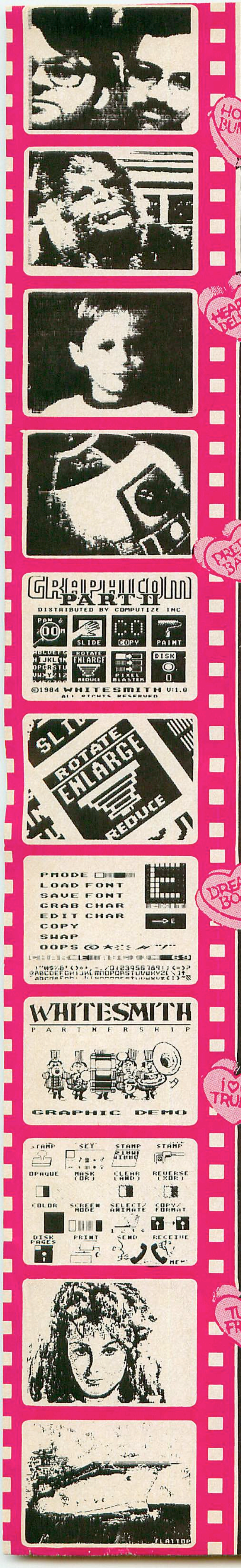
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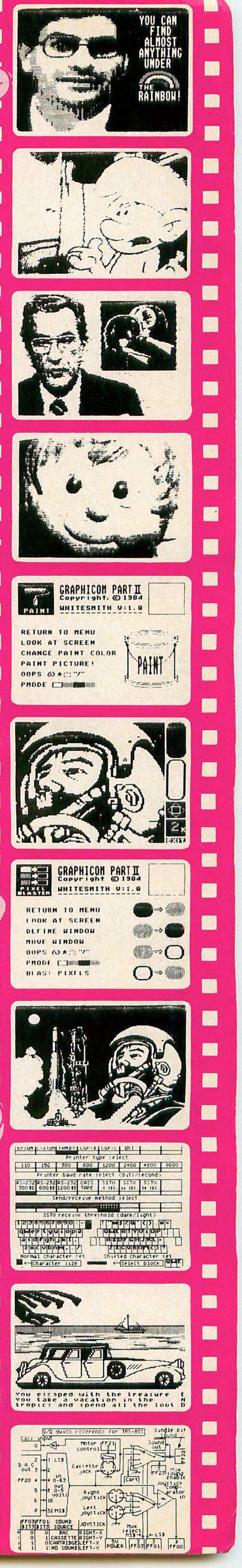
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LOOK AT SCREEN
CHANGE PAINT COLOR
PAINT PICTURE!
OOPS
PMODE
GRAPHICOM PART II
Copyright © 1984
WHITESMITH V:1.0
PIXEL BLASTER
RETURN TO MENU
LOOK AT SCREEN
DEFINE WINDOW
MOVE WINDOW
OOPS
PMODE
BLAST PIXELS
Printer type select
Printer baud rate select (bits/second)
Send/receive method select
Normal character set
Shifted character set
Character size
Select block
You escaped with the treasure
You take a vacation in the tropics and spend all the loot
I/O quick reference for TRS-80C
Motor control
Cassette jack
Single bit sound
Right joystick
Left joystick
Joystick comparator
LOVE 'N HUGS
SUGAR 'N SPICE
SWEETIE PIE
CUTE COOKIE
LOVE 'N KISSES

GRAPHICOM/ VIDEO DIGITIZER $199.95

Input directly into Graphicom for easy enhancements, manipulation, stamping, and storage. Catalog all your favorite "video photos" of your friends, family, movie & TV characters on diskette.

Accepts composite video signal in (1.0v p-p) from video camera, VCR, video disc player, another computer, or other compatible video sources.

View "off air" or "VCR" digitized video at close to real-time. "Snapshot" video frames to the digitizer's internal memory. No slow, "blurry" serial manipulation . . . just hit your joystick's fire button! It's that simple.

Use with your multi-pak or a "Y" cable ("Y" cable available at $19.95)

Video is input via a "BNC" connector. External controls for HORIZONTAL POSITION, VERTICAL POSITION, HORIZONTAL WIDTH, BRIGHTNESS, and CONTRAST (FUZZ) settings.

Don't be fooled by imitations...this is the GRAPHICOM VIDEO DIGITIZER . . . the **only** digitizer that "DIRECTLY" inputs into Graphicom (The original design by Cheshire Cat, the folks that brought Graphicom to the COCO world).

REQUIRES 64K COCO, 1 DISK DRIVE, AND 2 ANALOG JOYSTICKS. FREE GRAPHICOM PROGRAM, PICTURE DISK, AND GRAPHICOM UTILITY SUPPLIED WITH PURCHASE OF VIDEO DIGITIZER (A $50 VALUE).

GRAPHICOM PART II $24.95

Graphicom Part II is a video processing package that provides many functions that are missing in Graphicom. Here are just a few of the features provided by Graphicom Part II:

ENLARGE/REDUCE/ROTATE

Enlarge or reduce any portion of a screen by any amount, just like a photographic enlarger! Independent of the enlargement or reduction, rotate by any degree or fraction of a degree about any point on the screen.

PAINT

No more clumsy "stamping" to get your colors! Paint or "fill" any irregular area on the screen! More than 50 different colored patterns available. Unlike Extended Basic's PAINT command, painting will stop at any boundry. Undo or "Oops" function allows experimenting, and prevents time consuming mistakes. Additional paint patterns may be user-defined.

PAN & ZOOM

"Zoom in" x2, x4, or x8 on any portion of the screen to do fine pixel work. Allows editing of Graphicom character sets with ease!

TYPESETTER & FONT EDITOR

Add text in 16 different sizes with several display modes to chose from including COLORED FOREGROUND & BACKGROUND text! Edit 8x8 characters for use in the typesetter. "GRAB" function allows transfer of some Graphicom character sets to Graphicom Part II format.

PIXEL BLASTER

Allows the user to easily substitute or remove colors. Widen lines, swap BLUE & RED without effecting BLACK & WHITE, etc.

GRAPHICOM PART II DOES NOT REQUIRE GRAPHICOM TO RUN!

Graphicom Part II requires a 64K extended disk basic system, it will load and save both standard BIN files and Graphicom screens, and supports 1 to 4 disk drives with keyboard or joystick (analog or switch type). All functions support color or Hi-Res operation, as well as 4 screen display modes.

LAST CHANCE! SPECIAL $49.95
- GRAPHICOM
- G.C.U.
- GRAPHICOM PART II

a $70 value!

PICTURE DISKS $9.95

Available from COMPUTIZE

4C	Artifact color palette
5C	Large character sets drawn with master design (from Derringer Software)
6C	Same as 5C but set up as stamp set
7	Miscellaneous Art Set #1
8	Miscellaneous Art Set #2
9	Miscellaneous Ads and Examples
10	Miscellaneous Fonts
11C	Artifact color palette type fonts
12C	Art demo from WHITESMITH
13C	GRAPHICOM PART II function demo

GRAPHICOM $24.95

Simply stated · One of the finest graphics program written for the Color Computer!

- U-S-E-R F-R-I-E-N-D-L-Y !
- 4 Display modes (Including Hi-Res red/blue artifact)
- Animate mode
- Color Palette with over 15 color patterns for use with Hi-Res artifact
- Send/Receive pictures over standard modem at 300, 600, or 1200 baud
- Supplied utility allows capturing Hi-Res screens from most COCO arcade games (even protected ones)
- Multiple Hi-Res character fonts (user redefinable)
- Supplied utility for transferring Graphicom screens to Basic or other M/L programs.
- Supplied utility for loading screens from Basic or other sources
- Built in Hi-Res SCREEN PRINT (compatible with EPSON, C-ITOH, GEMINI-10, OKI, plus Radio Shack's LP-VII, LP-VIII, DMP-100, DMP-200, and GCP-115 printers) from 110 to 9600 baud
- Slow-scan television SEND/RECEIVE options
- Many additional features, operating hints, hardware mod's and suggestions, etc.

★ EASY TO LEARN GRAPHIC MENU ★
REQUIRES 64K COCO, 1 DRIVE SYSTEM, AND 2 ANALOG JOYSTICKS

G.C.U. GRAPHICOM UTILITY $19.95

- **MULTI DRIVE** · Copy pictures from one disk to another.
- **KILL** · Blank out individual pictures on a pix disk.
- **TRANSFER** · Copy pictures between Graphicom and binary formats.
- **DISPLAY** · View individual pictures.

Computize INC.

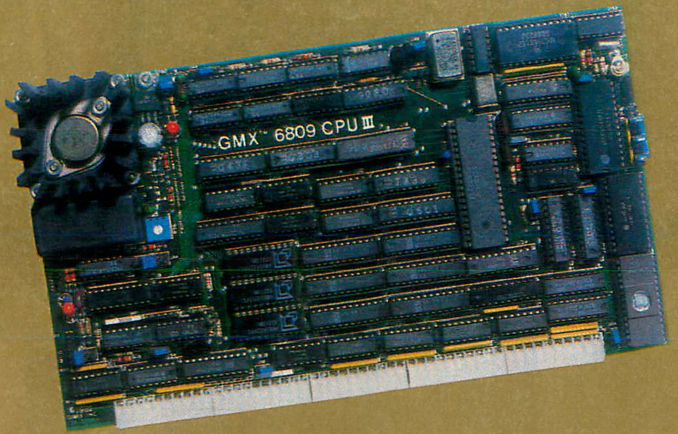
(215) 946-7260 P.O. BOX 207 • LANGHORNE, PA 19047

VISA MasterCard

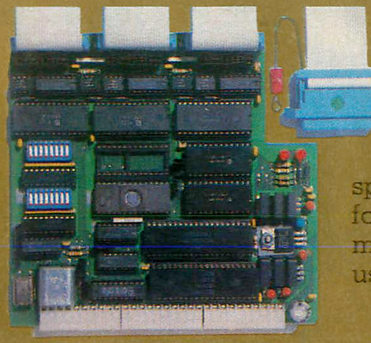
Check or M.O. • Add $3.00 shipping • PA residents add 6% sales tax

GIMIX STATE OF THE ART 6809 SYSTEMS FOR THE SERIOUS USER.

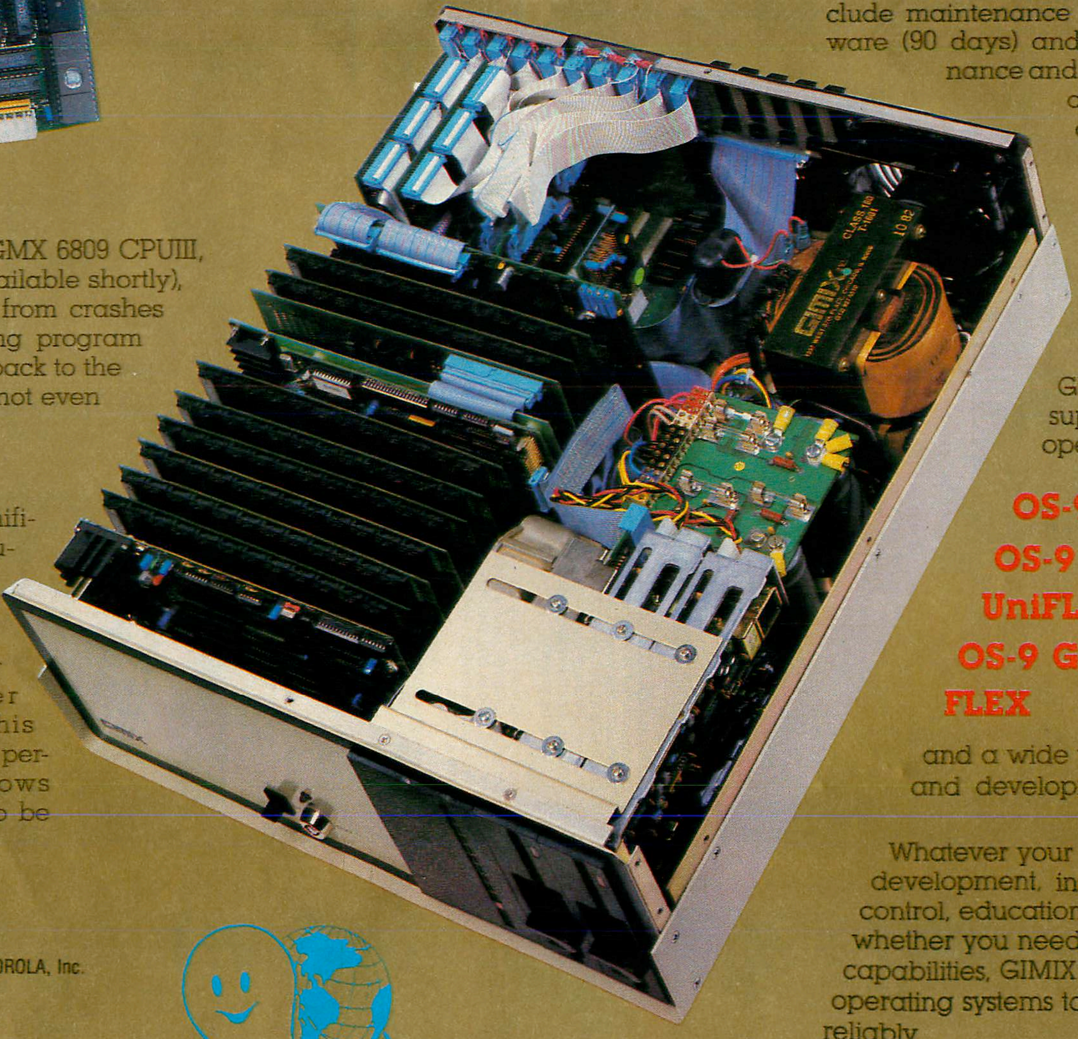
GIMIX has 19MB or high performance 47MB Winchester Drive Systems and/or Floppy Disk Drive Systems.



For the ultimate in performance, the Unique GMX 6809 CPUIII, using either OS-9-GMXIII or UniFLEX GMXIII (available shortly), gives protection to the system and other users from crashes caused by defective user programs. e.g. During program development, a programmer who crashes goes back to the shell or the debugger, while the other users are not even aware anything occurred.



The intelligent serial I/O processor boards significantly reduce system overhead by handling routine I/O functions, thereby freeing up the host CPU for running user programs. This speeds up system performance and allows multiple terminals to be used at 19.2K baud.



For the user who appreciates the need for a bus structured system using STATIC RAM and powered by a ferro resonant constant voltage transformer.

GIMIX has single user systems that can run both FLEX and OS-9 or Multi user systems for use with UniFLEX or OS-9.

GIMIX versions of OS9 and UniFLEX include maintenance and support by Microware (90 days) and TSC (1 year). Maintenance and support after this period are available at extra cost.

(NOTE: this support and maintenance is only for use with approved GIMIX hardware)

GIMIX 6809 systems support five predominant operating systems:

OS-9 GMX III,
OS-9 GMX II,
UniFLEX,
OS-9 GMX I,
FLEX

and a wide variety of languages and development software.

Whatever your application: software development, instrumentation, process control, educational, scientific or business; whether you need single or multi-user capabilities, GIMIX has hardware and the operating systems to get the job done reliably.

Please phone or write if you need further information.

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Move up to **XEX**, the powerful, yet easy to use operating system for the 64K CoCo. **XEX** stands for e**X**tended FLEX, the most widely used operating system for the 6809. More software is available for FLEX than any other operating system and **XEX** will run all of it. **XEX** includes a powerful editor and assembler plus DBASIC.

All for only **$99.95.** Rush your order in today.

SPECIFICATIONS: XEX's **SCREEN** has user definable fonts, many of which are supplied. 24 X 51 is the default screen size, but this can be changed to suit the user. Smooth scroll, sideways scroll, invert display, and 4 cursor types are just some of the features. XEX's **KEYBOARD** has user definable keys, supports extra key keyboards, auto key repeat, line editing and command repeat. **XEX DISK DRIVERS** supports all sizes, 35, 40 or 80 track, single and double sided and density. Also supports double stepping so that 40 track disks can be used with 80 track drives. Individual stepping rates for drives are definable. **MODULAR CONSTRUCTION** allows easy modification and changes to XEX. It is easy to add or modify the drivers for things like Word-Pak and other hardware, because most of the source is included. **SOURCE IS INCLUDED** for the screen drivers, keyboard drivers, disk drivers, printer drivers, initialization code, other system code, external terminal, and many of the utilities, making modifications simple. It is easy to create your own custom version of XEX. Other major packages include ED, a powerful screen-oriented line editor. **ASM** is a conditional MACRO assembler. **DBASIC** is Radio Shack Disk BASIC modified to work with XEX. RTF allows copying text files from RS BASIC to XEX. 128K support is built into XEX. XEX stands for eXtended FLEX and is compatible with FLEX, runs all FLEX software and supports all the functions that CC FLEX does, plus the above added features. XEX is supplied on three 5-inch disks and has a 3-ring bound manual. The tutorial section gets you up and running with a minimum of hassle or confusion. XEX proves that an operating system doesn't have to be complicated to be powerful.

COMPARISION CHART BETWEEN XEX AND OS-9

FUNCTION	XEX	OS9
Hi-Res screen (24X51 default)	YES	NO (O-Pak $34.95)
Supports all disk drives	YES	NO (SDisk w/bootfix $35.95)
User definable keyboard	YES	NO
User friendly, easy to use	YES	NO
Some system source included	YES	NO
Powerful screen like editor	YES	NO (Simple line editor)
Conditional Macro Assembler	YES	NO (No Macro capability)
RS BASIC compatible with DBASIC	YES	NO
Supports 128K upgrades	YES	NO
One disk boot	YES	NO (Yes if you have DOS)
Telephone support	YES	NO
Supports 3rd party hardware	YES	NO

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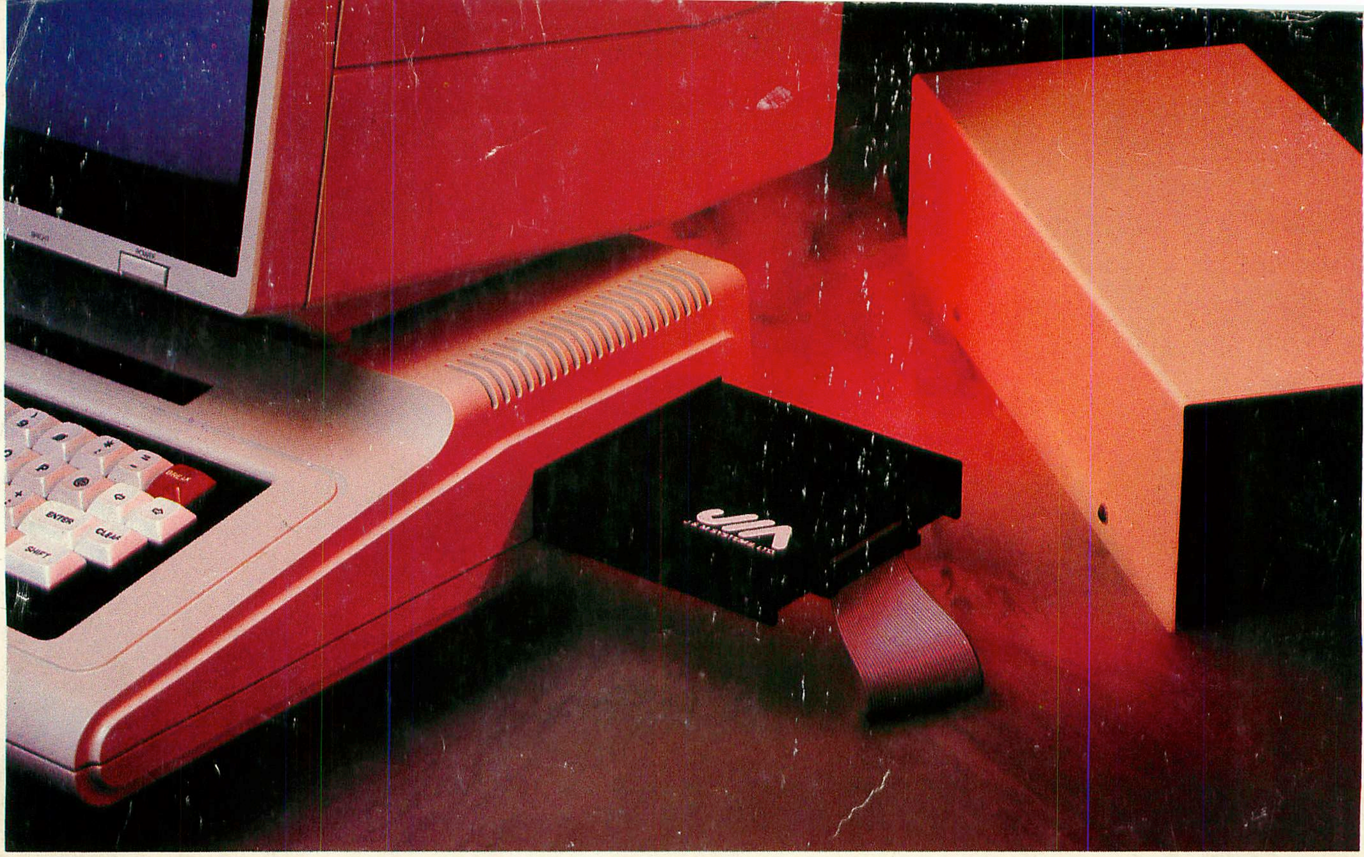

Heat Up Your COCO With J&M'S *Hot* Disk Controller

DRIVE 0 SYSTEM $289

Upgrade your COCO by adding J&M's famous disk controller, our advanced JDOS operating system, and a top quality drive all for only $289.

Drive 0 System with one single side drive	$289
Drive 0,1 System with two single side drives	$429
Drive 0,1 System with two double side drives	$499

JFD-COCO DISK CONTROLLER $139

The J&M Systems' JFD-COCO Disk Controller has set new standards in performance and quality. Gold contacts assure reliability, built-in digital phase lock loop data separator means NO adjustments, and the JFD-COCO is plug compatible with both the original COCO and the new COCO-2.

JDOS

JDOS implements all RS DOS basic commands, plus many more, including auto line numbering, up and down arrow keys for scrolling, DOS to boot OS/9*, FLEX*, and error trapping. JDOS supports RS compatible disk formats, plus handles 40 track single side and double side drives.

DISK DRIVES

A drive is just a drive without a case. We manufacture our own high quality cases and TransPower power supplies. Gold contacts are brought out at the back for easy connection.

*MEMORY MINDER**

Memory Minder is a disk drive test program that makes the following major checks of your drives without disassembly or special test equipment: head alignment, disk speed, index hole timing, azimuth, hysteresis, read sensitivity, and clamping. Memory Minder can be used to actually align the drives while viewing the graphics on the screen. This program is a must for anyone who values the data that is saved on diskettes.

MM-COCO-1 Memory Minder for single side drives	$79
MM-COCO-2 Memory Minder for double side drives	$99

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